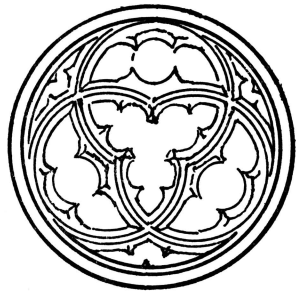
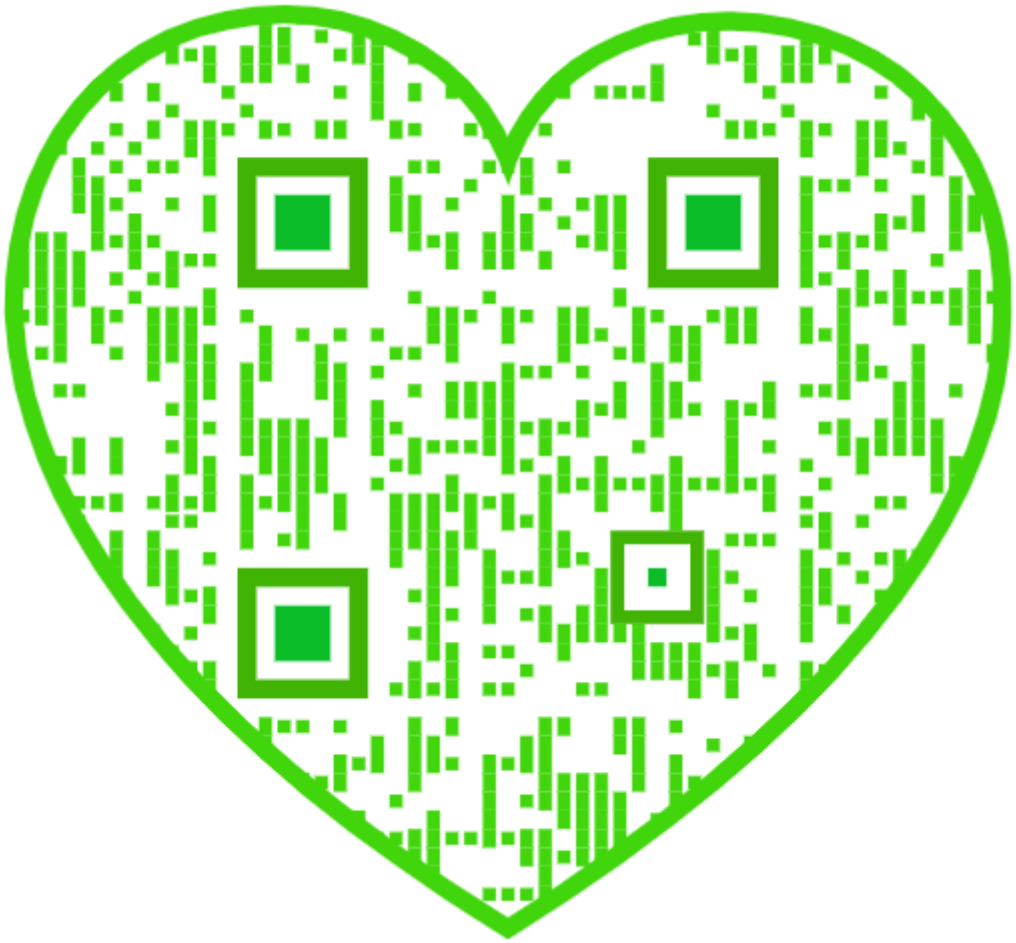
THE
THEORY OF MOULDINGS

BY

C. HOWARD WALKER
Fellow of The American Institute of Architects
Associate National Academy
Doctor of Fine Arts University of Pennsylvania



J. H. JANSEN - CLEVELAND, O.
1926



Copyright 1926 by
J. H. JANSEN
All rights reserved
Printed Aug. 1926

Printed by
THE NATIONAL PRINTING CO.
Cleveland, Ohio
U. S. A.

TABLE OF CONTENTS

CHAPTER I

PAGE

Introductory—The Use of Mouldings in Design 1

CHAPTER II

Mouldings 8
Definition of Mouldings 8
General Conditions—Strength 9
General Conditions—Dominance 11

CHAPTER III

Structural Derivations 25
Influence of Material— 26
Influence of Material—Reeds 27
Influence of Material—Clay 27
Influence of Material—Wood 30
Influence of Material—Stone 33
Influence of Material—Metal and Glass 37

CHAPTER IV

Genesis of Types—Columns 39
Genesis of Types—Capitals 39
Genesis of Types—Structures in Wood 40
Genesis of Types—Joints and Corners 41
Genesis of Types—Vertical Types 41
Genesis of Types—Entablature 43
Genesis of Types—The Orders 46

CHAPTER V

Effect of Mouldings 48

CHAPTER VI

The Nomenclature of Mouldings 54
Simple Sections 54
Mouldings of Combined Convex and Concave Factors 56

CHAPTER VII

Analysis of Shapes—Mouldings of Planes 60
Analysis of Shapes—Mouldings with Curved Profiles—Single Curves 64
Analysis of Shapes—Convex—Single Curve Mouldings 64

CONTENTS—Continued

	PAGE
Analysis of Shapes—Concave—Single Curves	65
Analysis of Shapes—Proportions of Groupings	66
Analysis of Shapes—Mouldings of Compound Curves	71
Analysis of Shapes—Traditional Combinations	73
CHAPTER VIII	
Grouped Mouldings	75
Metal Mouldings	76
Turned Forms	76
CHAPTER IX	
Positions of Mouldings	78
Influence of Position upon Horizontal Mouldings	79
Base	80
Wall	81
Logs	81
Joints	82
Pier	83
Shaft	84
Capital	85
Entablature	88
CHAPTER X	
Derivation of The Orders	92
The Greek Doric Order	95
The Greek Ionic Order	96
The Greek Corinthian Order	100
CHAPTER XI	
Early Christian Architecture	105
Round Arched Architecture	105
Gothic Architecture	107
CHAPTER XII	
Window Tracery	114
Renaissance Mouldings	125
Oriental Mouldings	138
CHAPTER XIII	
Design of Mouldings	139
The Ornamentation of Mouldings	142
Panel Mouldings	143
Mouldings with Gradations of Sections	144

CHAPTER I.

INTRODUCTORY

THE USE OF MOULDINGS IN DESIGN

In designing, the relative positions, the relative scale, and the consequent relative tones are of more importance in the first conception of the work, than is the selection of the profiles, as these must be made to conform to all three of the above considerations.

The design is one of parallel striped ribbons placed as the construction demands, but so adjusted and proportioned that they will produce a harmonious and agreeable effect.

In general the stripes of these ribbons will be closer together at the top of a vertical surface than at the bottom, but the elements of repeat, alternation, and ratio, which are at the basis of all design, can be applied to them. The widths of the ribbons, the distance apart of the stripes, the widths of the stripes and the varied tones of the stripes once satisfactorily established, the profiles or sections which will produce the desired result are then to be considered. The same method applies to vertical and arch mouldings and to frames.

In the use of mouldings, the character and the scale of members and groups have been too often merely copies or translations from previous examples which seemed applicable. No analysis or knowledge of the causes which produced the originals was evident in the copies. Taste, good or bad, resulted merely from association. The purpose of this book is to indicate when, how, and of what materials mouldings were produced and when and how they are of value.

There are two definite and distinct families of mouldings and in both there are many species and variations. Of the first family, A—are all mouldings derived from wood construction; of the second B—those derived from stone construction. Mouldings in metal, stucco and clay are variants of one or the other of these two types. To the first family, A—belong the mouldings of Egypt and of all Classic architecture and of most of the Mohammedan

and of the Oriental architecture of India, China, Japan, etc. To the second family, B—belongs the mouldings of the so-called Medieval and Gothic styles.

The mouldings of both A and B at first appear singly and later are combined into groups. The combinations are the result of the association of structural factors, and these, being confined to a few elements, a few well established and defined groups of mouldings occur again and again. All attempts to greatly vary the character of these groups or combinations merely result in either a denial or contradiction of the elements of the structure which have occasioned the mouldings originally.

Therefore it is plain that a knowledge of simple constructive factors is necessary in order that the mouldings associated with them be appropriate. The factors are few; 1st—The vertical post —or column; 2d—the beam from top to top of posts; 3d—the ceiling rafters; 4th—the roof rafters projecting and forming eaves; 5th—the frames which form panel spaces of walls, doors, etc.

The arch is but a curved beam.

All architecture is put together of pieces, that is, it is articulated.

At the places of contact of the pieces occur joints through which, if the construction is of wood, air and rain can penetrate, and water cause rot.

Therefore, these joints were protected and covered by small strips of wood, or cleats, from which most classic mouldings are derived. These covering cleats do not need to be broad nor large, nor of many factors in profile.

There is no more common fault in designing mouldings than that of making them excessive in quantity and scale. Restraint in their use is a virtue, as is shown by the proportions and sections of Greek mouldings.

As the cleats were applied to the general surface, it follows that Classic mouldings project in front of the surfaces while those of Class B, i. e., Gothic, are in most cases cut into the planes of the stone. In Class B, the following desires have produced the mouldings; first, to cut away superfluous stone which interfered with the entrance of light through openings by bevelling outside and inside of openings, which created traceries; second, to round vertical stone angles to diminish injury of those angles, which pro-

duced colonettes upon corners; third, to shed snow from the top surfaces of horizontal projections, such as capstones to walls, copings, buttress caps, string courses, etc., which produced the top bevel to those factors. The top bevel was unnecessary upon interior work, but having developed upon the outside it invaded the inside of the building.

Upon the underside of projecting horizontal mouldings there was used a deep undercut to prevent rain and melting snow from running back and down upon the face of the walls. Fourth, the removing of unnecessary weight in vault ribs.

The Classic mouldings are necessary additions, the Gothic mouldings are desired subtractions. In both cases, restraint in use is a prime virtue.

The second purpose of mouldings apart from indicating and accenting structural factors, is to produce effects of light and shade which are harmonious in character, and no method is so satisfactory in this respect as that of having the mouldings designed with what may be called a facial angle, which is maintained throughout by designing horizontal mouldings within parallel planes. This is essential upon exteriors which are lighted by the parallel rays of the sun, but is much less necessary in interiors, which have cross lights and reflected lights. Bases have reversed planes of which the angles are gauged by their position in relation to the eye of the spectator.

Any projecting lath-like cleat gives a sharp shadow line, with clean cut definition, but if used without the intervention of mouldings with curved profiles, the effect is dry and crude even if varying in widths, and is like ruled lines of identical tones. The values of mouldings with curved profiles is therefore the production of variations of tone, thereby creating interest and distinction. Frequently in Greek mouldings, the sharp shadow lines were obtained by incised lines within the face of the stone, and many of the shadows of the medieval mouldings are produced in a similar manner. But the curved sections must have their boundaries defined or the shades they create will slur into the surfaces of the planes to which they are related, or into other curves. It is of the utmost importance that these outer boundaries should be announced, and because of this, curved sections either impinge upon planes at an acute or

at a right angle to the plane, or are separated from it by a small bead or fillet. No curved section is benefitted by having more than two curved factors in it and is best when these factors are adjacently contrasted, i. e., concave and convex. Upon observation it will be apparent that the most satisfactory mouldings are profiled in that manner, and that the individual factors of the mouldings are separated from each other and have their outer boundaries defined by small accessory factors separating them from the planes.

Convex mouldings have excess of material. Concave mouldings reduce material. Convex mouldings therefore, are robust, appear sturdy, and are vigorous and often crude in expression.

Concave mouldings weaken surface but give powerful shadows, and if skillfully used are delicate in expression.

It is by careful combination and relative proportion of both that the skill of the designer of mouldings is manifested. Each is the direct opposite of the other and when used together in equal proportion they cancel each other. It follows that in designing mouldings there should be a thorough conception of the effect desired, and the mouldings which shall best produce that effect which should be adopted, i. e., whether convex or concave, and a dominant type should be used. As a foil to this dominant, in less quantity or size, should be introduced the contrasting type, in order that monotony should not occur. Dominance of desired characteristics, both as to facial angle and to general type are the first objects of consideration, after the position of the mouldings as influenced by the parts of the structure are determined.

Another factor which enters into the study of mouldings is the visual limitations of the eye. In all structures there is an acknowledgment of the law of gravitation which concedes that the lower part of a vertical structure should apparently be thoroughly capable of supporting the upper part. The simplest method of obtaining this impression is to make the lower factors larger than the upper in their vertical widths, and therefore to place the lower horizontal mouldings further apart and make their factors broader than those towards the top. But another factor enters into the problem, i. e., the farther mouldings are from the eye the less are fine subdivisions of profiles perceptible; while near the eye they are readily

appreciated. Therefore, the groups of mouldings near the eye while larger in scale in the factors of each group, can be more richly developed than those with smaller scale factors far from the eye.

Also, above the eye, the under side of projections, i. e., the so-called soffites, though in shadow should be considered, and enrichment of the soffites is valuable in the effect. This is especially evident in the Corinthian order of Architecture. Mouldings around panels should be proportioned in relation to the character of the panel they surround, but should be small if the panel is plain, and become of more importance only when the panel becomes important, from size, change of material or decorative enrichment.

Mouldings should be harmonious in character throughout the work, and if they are ornamented by carving or color, the ornament should not be confined to any single group, but should be echoed through other groups in the Composition. Usually, ornamental treatment of mouldings is the most satisfactory when the direction of the factors of the ornament is across the direction of the mouldings and the axes of the motives of the ornament are not farther apart than the width of the moulding, though, the difficulty of turning a corner can be obviated by the insertion of a specially designed corner ornament. The ornamentation of a moulding at once weakens its shadow, and breaks its continuity of line into a broken line of dot and dash as in the bead and fillet, or into a series of spots of high light alternating with shadows or half tones, as in the egg and dart, and the Gothic ball-flowers in Cavettos or scotias.

Ornamented mouldings are of great value in establishing or restoring scale by the distance apart of their repeats. Mouldings which merely have their surfaces enriched by patterns of general tones are comparatively ineffective and should be only used near the eye. Mouldings ornamented with designs running with the direction of the moulding, such as ropes, horizontal scale patterns, of long leaves, etc., are secondary mouldings only, inserted in small proportionate numbers to give occasional contrasts. They always appear crude and undeveloped if used alone. Ornamented mouldings should be well defined by a straight undecorated moulding upon their highest outside boundary—with the exception of

some edge mouldings upon furniture.

As mouldings are minor, not major factors in design, it is natural that redundancy is not a virtue in their use but is to be avoided. Restraint, rather than enthusiastic abundance, gives distinction. In this respect, the Greeks were far superior to the Romans, and the Florentines of the first half of the fifteenth century to the purveyors of the Baroque of the seventeenth.

Size is always esteemed by man as indicative of power, as having a certain austerity, and nobility of mass. Superhuman scale is impressive. But the more heroic the scale, the less it requires detail which belittles it, and which with the intention to adorn, merely destroys simplicity. This is especially true in regard to the use of mouldings.

The larger the objects to which they are applied, the less in comparative areas are they acceptable. Small objects can be profiled entirely by mouldings. Large objects demand that the integrity of their masses be respected. It follows that, in many of the minor arts, many combinations of mouldings appear, but in most cases, many of these combinations could be eliminated to advantage. The contours of pottery, of fine vases, etc., are in themselves exquisitely proportioned and studied mouldings, which require no further adornment, and which again prove that restraint is a paramount virtue in the silhouetting of shapes.

Of all faults in designing, that of the repetition of identical sections is one most to be avoided. It is comparable to tautology in speaking, where three or more words are used when only one was necessary. It seldom occurs in skilled work, though occasionally appearing in the style of Francis I and in Early English Gothic. If an even tone only is desired, as in the flutes of a column, it is justifiable, but under no other circumstances, as it accents nothing but merely striates a surface which is sufficient in itself.

The student realizing the necessity of maintaining the integrity of structure, and of the expression of that structure by the mouldings, appreciates at once the value of restraint, and the need of clearness of definition and the avoidance of confused expression. He recognizes the value of general harmony in character to be obtained by facial angles of mouldings, and the determination of

character by the use of a general type of mouldings in any one piece of work, and by establishing a dominant in each group that shall announce and control the group.

He realizes the comparative merits of convex form that have excess of material and therefore give an effect of sturdy strength and of concave forms which subtract from material and that give an effect of thoroughbred training, and also realizes that the use of one without the other tends toward dull monotony, while contrasts give interest and vivacity.

He appreciates that ornamentation of mouldings need not occur, and that when it does occur it is to enhance the interest in a work which should not necessarily require it but can be embellished by it; that ornamentation is a good servant and a very bad master.

Having these things in mind, he will come to the conclusion that mouldings are honorable things which are not to be treated casually or copied blindly.

CHAPTER II.

MOULDINGS.

In the Art of Architecture and in those minor arts which are associated with it, there appear no more constant and frequent factors of detail than mouldings, none more susceptible to change, to vagaries of choice, and none that are, upon the one hand, left more to fantasy, and upon the other to established precedent. There exist, nevertheless, fundamental elements of order in relation to mouldings, which, if ignored, destroy their effect. A consideration of these elements relating to mouldings and their use occasions the following pages. The illustrations are merely explanatory and are not exhaustive of the subject.

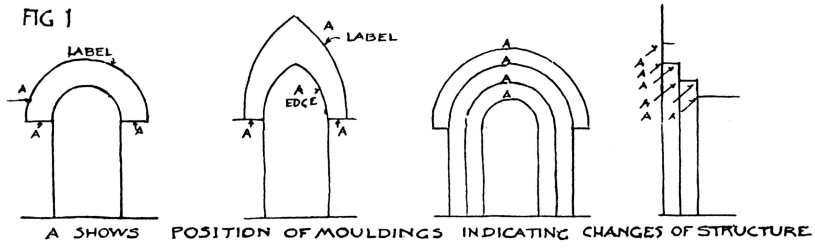
DEFINITION OF MOULDINGS.

Mouldings are unnecessary as factors of structure.

A Moulding, as its name indicates, is a modelled surface. Mouldings are not representations or imitations of nature, but are artificial creations of man.

A moulding is produced by the prolongation continued in one direction, in most cases in a straight line, or at other times in the curve of a circle or of an ellipse, etc., of a section other than that of a broad flat surface or plane. There are, however, varieties of mouldings in which the cross sections increase and decrease in size, or both, producing undulations of surfaces, and radiations of lines and twisted shapes. These, however, can usually be delegated to carving.

Mouldings define and accentuate structure and form and occur at the places of changes of surface, of material, of intention of expression, and of the articulation of complex structures (Fig. 1).



Mouldings upon surfaces are used to produce tones, either of texture or of shadow. They may be stratified in horizontal groups, as in bands or belts; or in vertical groups, as in flutes; and in ribbon panels; or they may define surface areas by concentric border lines, as in panelling, or in the treatment of the perimeters of each stone in the variations of joint treatment.

The earliest of all systems of decoration is that of series of parallel lines upon the outer edges of objects, the usual variation being obtained by cadenced intervals between the lines. Upon pottery these lines were obtained by pressing a sharp point into the clay, producing incised lines and channels with fillets between. These fillets when rounded in section, became beads, and the channels became flutes. It was a natural process to define or strengthen the perimeters of surfaces with these borders, and frames of fillets or beads around plain centres have always been an elementary form of decoration. In fact, in Mohammedan work the employment of such borders is by far the major part of the system of mouldings.

GENERAL CONDITIONS.

STRENGTH.

EFFECT

The sections of mouldings exercise a marked effect upon the general character of the work upon which they are employed.

This effect is entirely one of the association and the expression of definite forms by the attributes of strength and of refinement, i. e., an ultimate achievement devoid of the use of superfluous means. *No other consideration need be taken into account in most cases.*

GENESIS

The genesis of mouldings is structural and must be sought in the satisfaction of material requirements and conditions.

USE

As far as structure is concerned, mouldings are not necessary, but they are useful to define and accent its expression, and in so doing to increase its manifest quality of strength, and to give in addition a definite quality to the work by defining its factors.

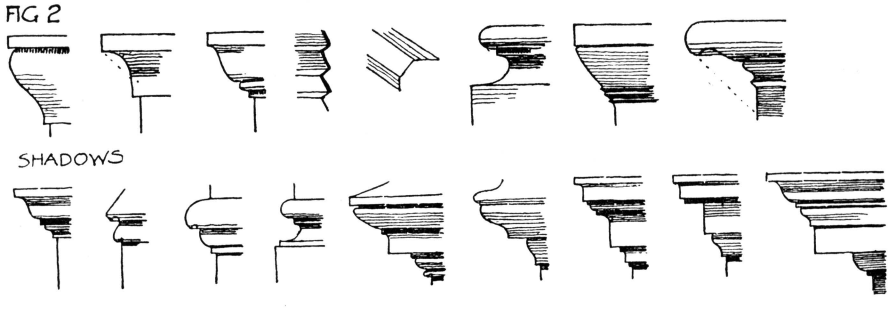
The association of the quality of strength with both form and material is entirely one of an experience which has become general in its interpretation.

LIGHT AND SHADE

Assuming the chief expression of mouldings to be in the beauty of contrast of their light and shade, irrespective of application or of material, they require study in relation to the direction of the light they receive.

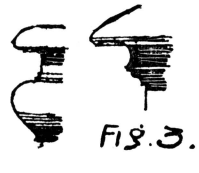
FACTORS

All mouldings have necessarily, as their factors, either planes or convex or concave sections. If planes, they reflect light in even, ungraded tone, of greater or less brilliancy, depending upon the angles of the planes to the direction of the rays of light, while if convex or concave they reflect graded tones with a greater proportion of light to shade in the convex than in the concave (Fig. 2).



PLANES

Flat mouldings, therefore, have greater individual scale, that is, they seem broader and larger, than those with more (pronounced) curved surfaces, and they are quieter and less subtle in effect and are therefore used as foils or contrasts to those of more complex sections.



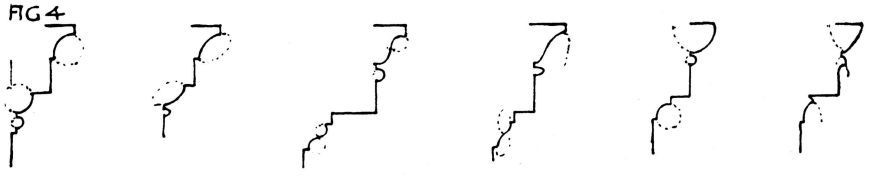
CONVEX
CONCAVE

Convex mouldings accent with brilliant high lights, while concave mouldings accent with equally strong shadows (Fig. 3).

GRADATION OF SHADE

In both these latter forms, if the section of the mouldings is a portion of a circle the gradation from dark to light is monotonously regular; therefore to obtain subtlety and refinement of light and shade the curved sections of mouldings are made hyperbolas or parabolas, or are drawn with a freehand line.

Nothing so tends to stale the effect of mouldings as to have their sections struck with compasses (Fig. 4).



TYPES

For the purposes of study, mouldings can be divided into four classes—flat, convex, concave and compound in section.

COLUMNS

Horizontal and vertical planes indicate relatively, stability and balance. Columnar forms, because of derivation from tree trunks and piers, give apparent assurance of vertical strength; and convex forms, from this association and from manifest adequacy of quantity of material, give similar impressions, as in the work derived from log construction in East Indian architecture.

ROBUST SHAPES

Sturdiness and robustness are therefore characteristic of convex mouldings (Fig. 5).

REFINED SHAPES

In direct contrast, *concave mouldings or hollows are subtractions from materials, and tend towards weakening the apparent vigor of structure, even when refining it* (Fig. 6).

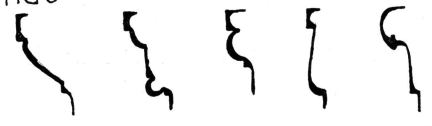
DOMINANCE.

DOMINANCE

An excess in quantity of either type tends towards monotony, and therefore both are associated, one or the other type being main-

tained in dominance as either vigor or refinement is desired, and in grouped mouldings alternation of the two is in constant evidence (Fig. 7).

FIG 5



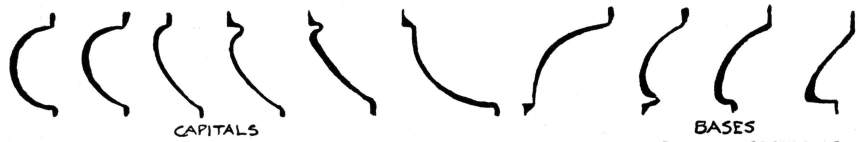


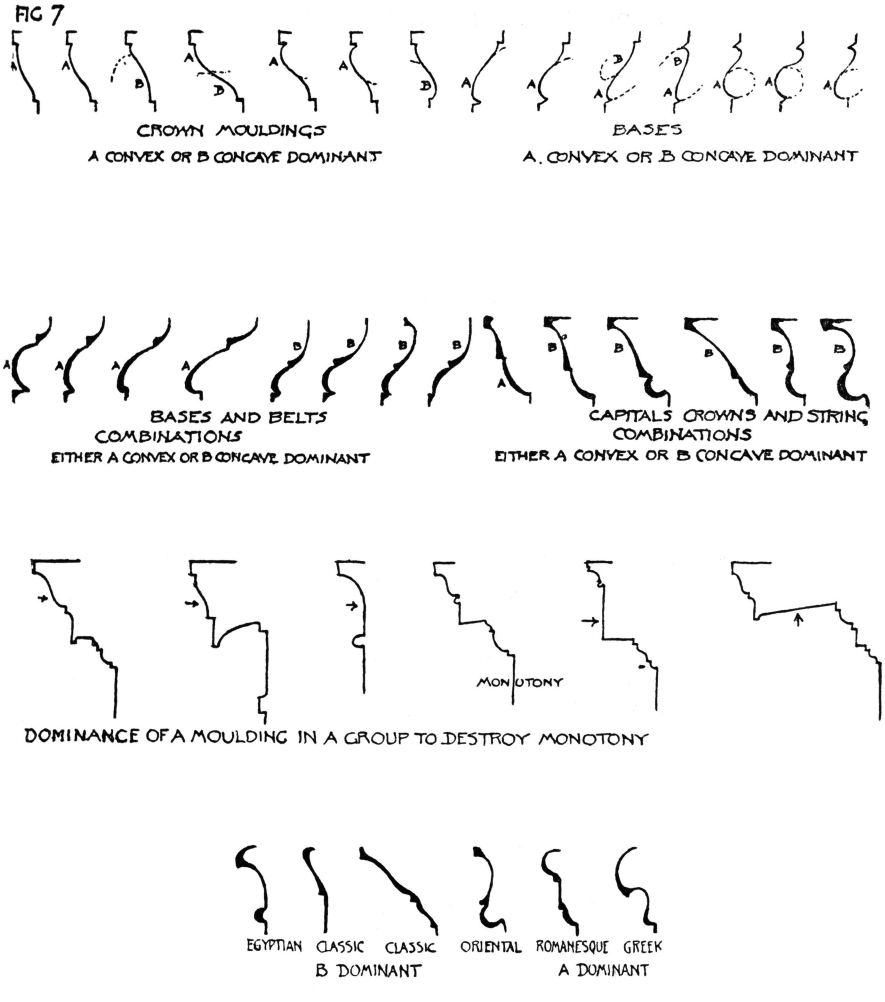
FIG 6

An example of the effect of dominance of type is to be found in a comparison of the Doric Theseion in Athens and the Madeleine in Paris. The two buildings are very similar in size and in conception. In the vigorous Theseion, planes and convex sections predominate, in the delicate Madeleine concave sections predominate.

The same effect may be observed by the comparison of cymatiums of the Greek Doric and those of the Corinthian order (Fig. 8).

MONOTONY

The repetition of identical units side by side of either type merely accents direction, or provides texture, as in the flutes of columns, or in some of the piers of early English Gothic, but are otherwise monotonous and valueless (Fig. 9).



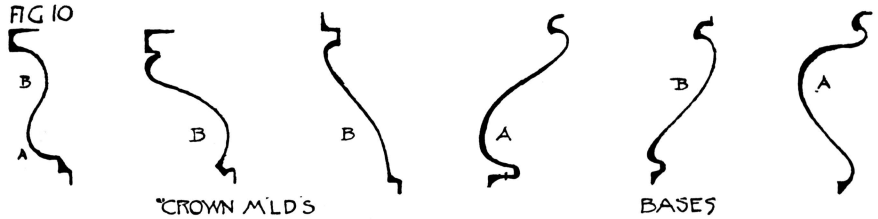
The natural progressive development of mouldings led to an association of convex and concave sections in one moulding, creating the ogees and cymas which gave greater individual breadth to the

FIG 8

CYMAS BASED UPON CONIC SECTIONS

FIG 9

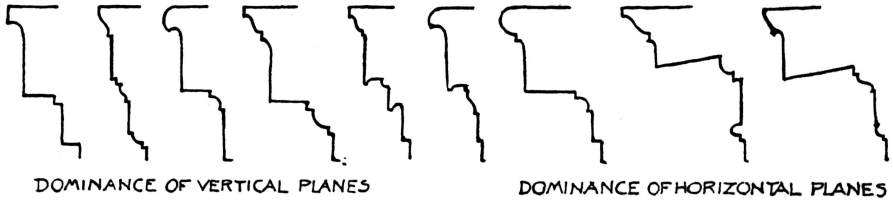
FIG 10



"CROWN MOLDS
DOMINANCE OF A CONVEX AND OF B CONCAVE

BASES

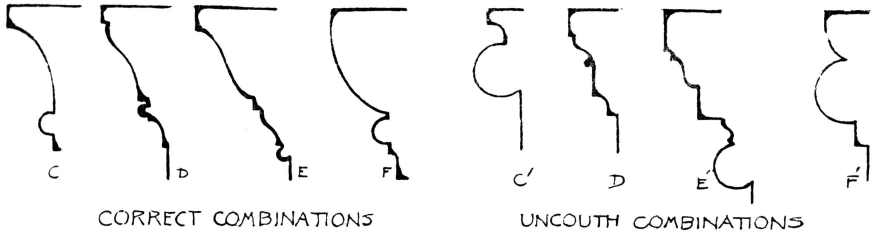
FIG 11



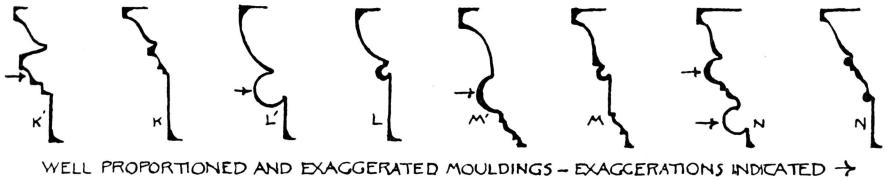
DOMINANCE OF VERTICAL PLANES

DOMINANCE OF HORIZONTAL PLANES

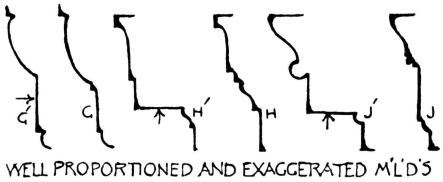
FIG 12



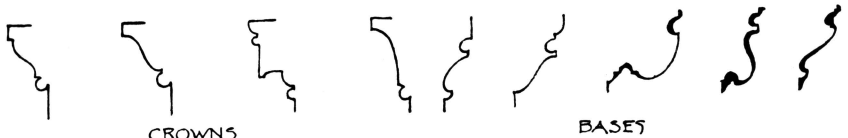
CORRECT COMBINATIONS UNCOUTH COMBINATIONS



WELL PROPORTIONED AND EXAGGERATED MOULDINGS – EXAGGERATIONS INDICATED →



WELL PROPORTIONED AND EXAGGERATED M'L'D'S
EXAGGERATIONS ARE INDICATED BY ARROWS

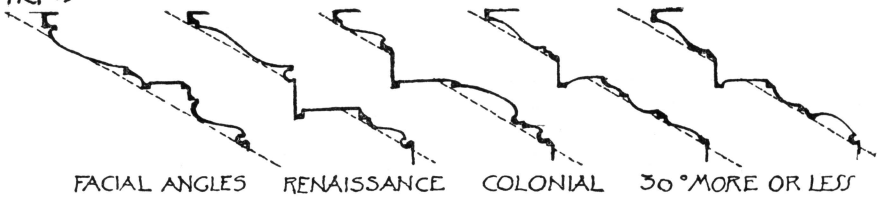


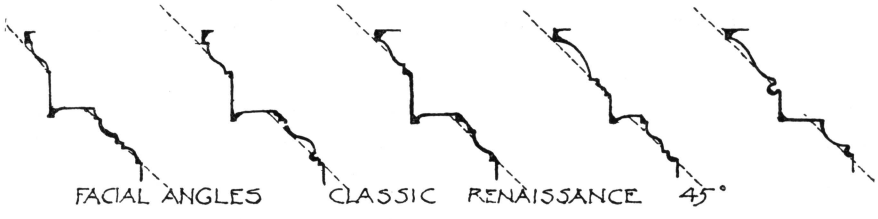
CROWNS
POSITION OF BEADS

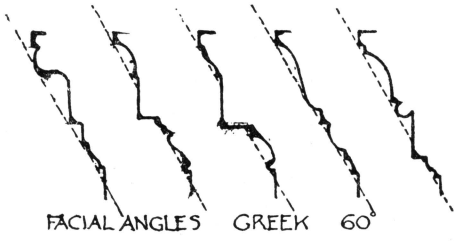
BASES
POSITION OF BEADS

BASES

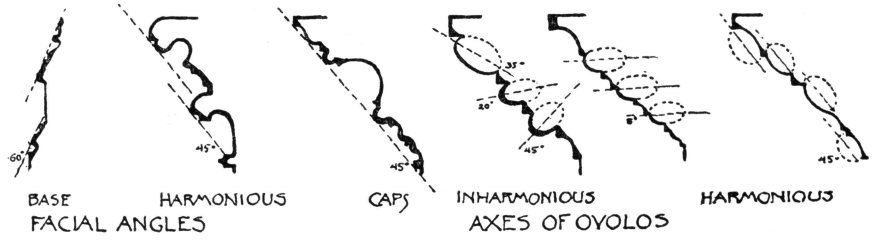
FIG. 13


FACIAL ANGLES
RENAISSANCE
COLONIAL
30° MORE OR LESS


FACIAL ANGLES
CLASSIC
RENAISSANCE
45°


FACIAL ANGLES
GREEK
60°

60°
45°
HARMONIOUS
FACIAL ANGLES
30°
45°
75°
60°
45°
INHARMONIOUS
60°
HARMONIOUS
60°
30°
45°
INHARMONIOUS


60°
45°
BASE
HARMONIOUS
FACIAL ANGLES
45°
CAPS
35°
20°
8°
45°
INHARMONIOUS
AXES OF OVOLOS
45°
HARMONIOUS

moulding and therefore greater scale than existed in alternated but separated convex and concave shapes (Fig. 10).

Mouldings define the edges of planes, and can be considered as analogous in their relation to the planes as are verbs and adjectives to nouns in language. The planes are passive, the mouldings are active, and at times aggressive (Fig. 11).

The little fillets between mouldings can be considered as conjunctions, and should never be exaggerated. This is equally true of minor beads (Fig. 12).

Direct and definite expression of mouldings is also analogous to language, varying from the silence of unmoulded surfaces and shapes to the refinements of the curved profiles analogous to tonal expression.

CLEAR EXPRESSION

Reiteration of identical mouldings is analogous to tautology (Fig. 9). It is important therefore that the expression should be clear and neither thick nor involved. It is this clearness of expression which occasions the sense of just proportions in mouldings.

FIG 14

VARIOUS SECTIONS PRODUCING SIMILAR SHADOWS

Simplicity and harmony of character and of scale are necessary for clear expression.

Simplicity should not deteriorate into monotony.

FACIAL ANGLES
HARMONY

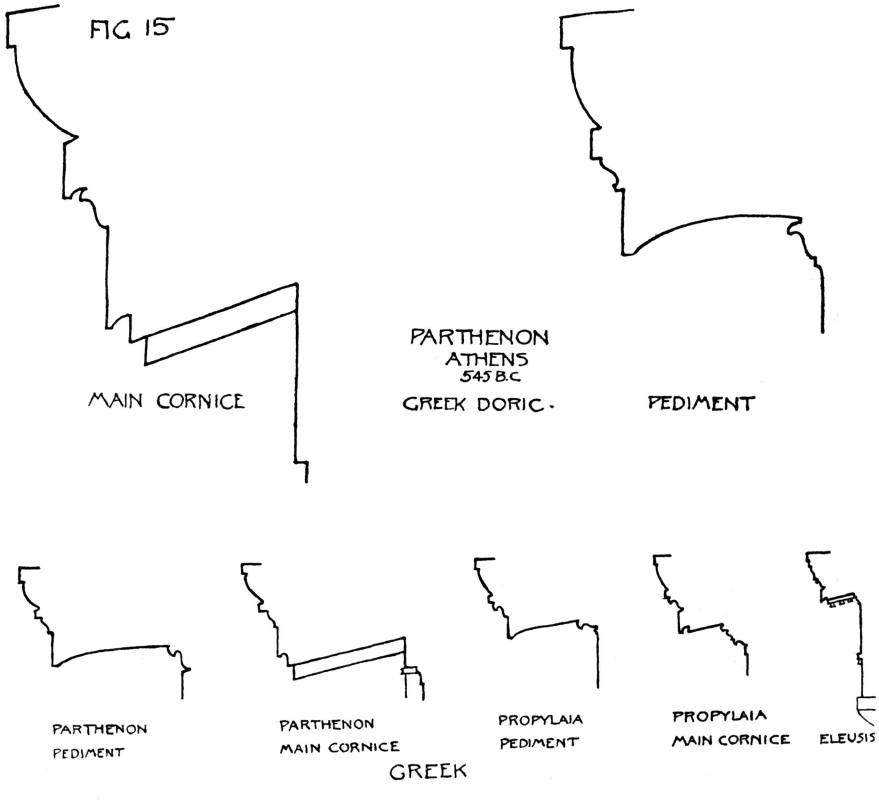
Harmony can be obtained by the use of facial angles, both in groups and in units, for by this means, the even quality of the tone of the shadows is maintained (Fig. 13).

SECTIONS

The sections of mouldings are to produce shadows, and to give individual profiles, but both require consideration, for while it is

possible to obtain similar shadows by various sections, the selection of the best section for the purpose demands careful study of the profiles (Fig. 14).

Mouldings which turn an exterior angle require special study, as their profiles are conspicuous.

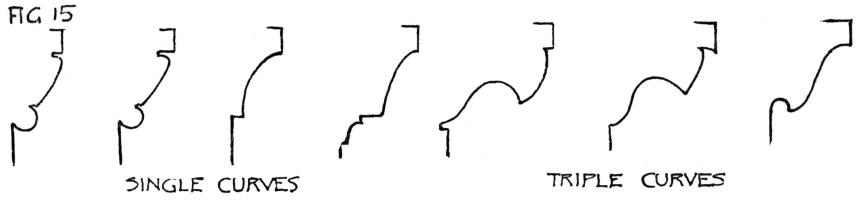


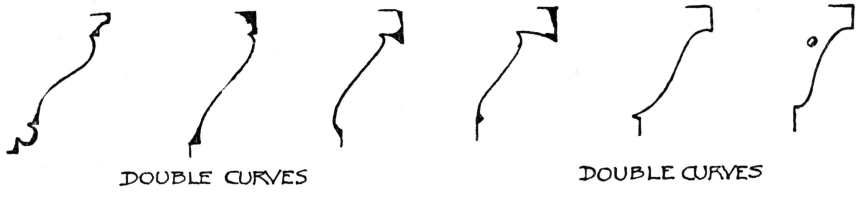
SUBTLETY

Subtlety and therefore increased interest and refinement in shadows is obtained by the use of sections which are not parts of circles, but are either freehand curves of ellipses or of conic sections, such as hyperbolas and parabolas. The Greeks appreciated *the fact, the Romans often ignored it* (Fig. 15).

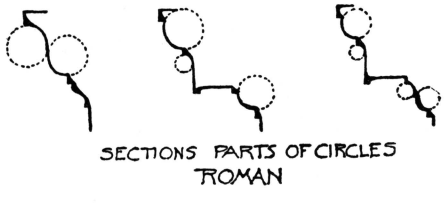
Nothing stales mouldings more than the universal adoption of sections of arcs of circles (Fig. 4).

FIG. 15


SINGLE CURVES
TRIPLE CURVES


DOUBLE CURVES
DOUBLE CURVES

SECTIONS ELLIPSES
SECTIONS HYPERBOLAS
SECTIONS PARABOLAS


SECTIONS PARTS OF CIRCLES
ROMAN

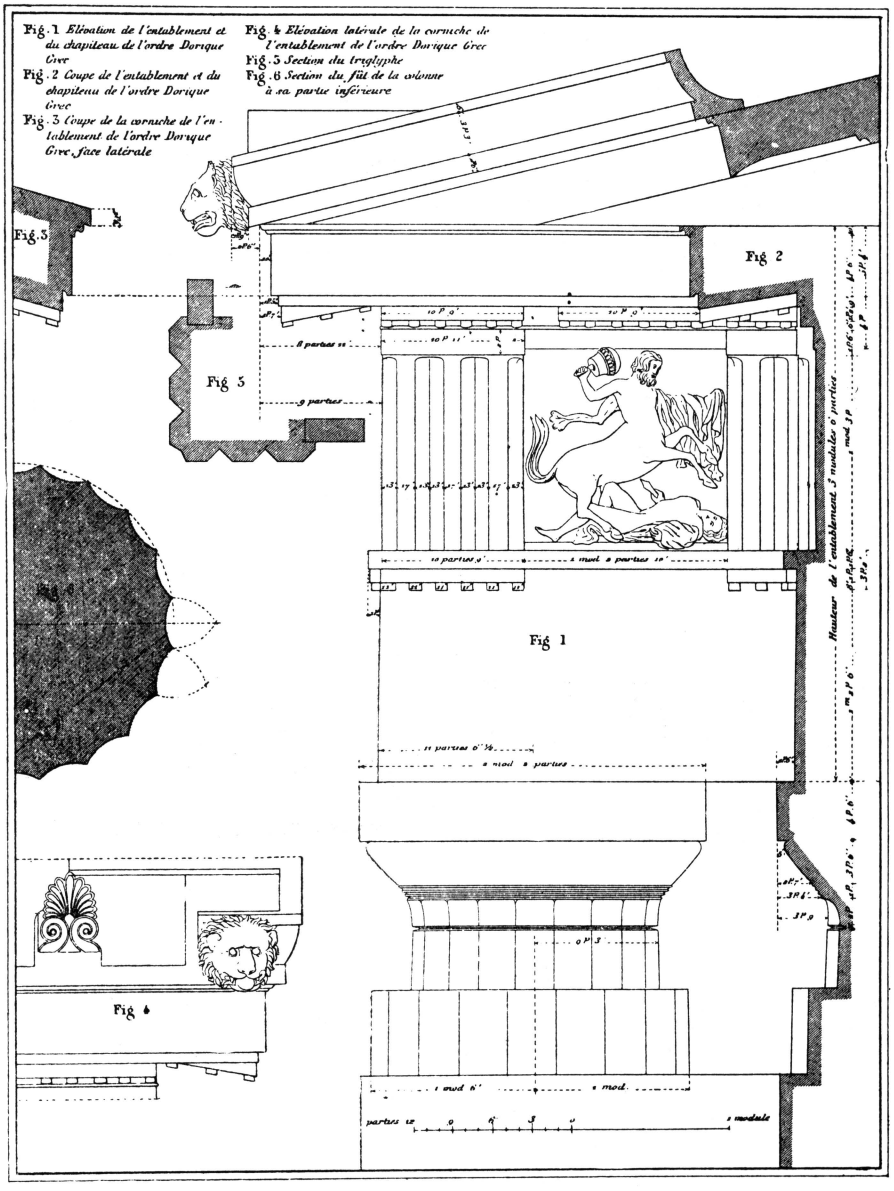


Fig. 1 Elévation de l'entablement et du chapiteau de l'ordre Dorique Grec
Fig. 2 Coupe de l'entablement et du chapiteau de l'ordre Dorique Grec
Fig. 3 Coupe de la cornache de l'entablement de l'ordre Dorique Grec face latérale
Fig. 4 Elévation latérale de la cornache de l'entablement de l'ordre Dorique Grec
Fig. 5 Section du triglyphe
Fig. 6 Section du fût de la colonne à sa partie inférieure
Fig 1
Fig 2
Fig 3
Fig 4
Fig 5
Hauteur de l'entablement 3 modules 6 parties

Fig. 15-A.—Detail of Parthenon from Esquie's—Vignole.

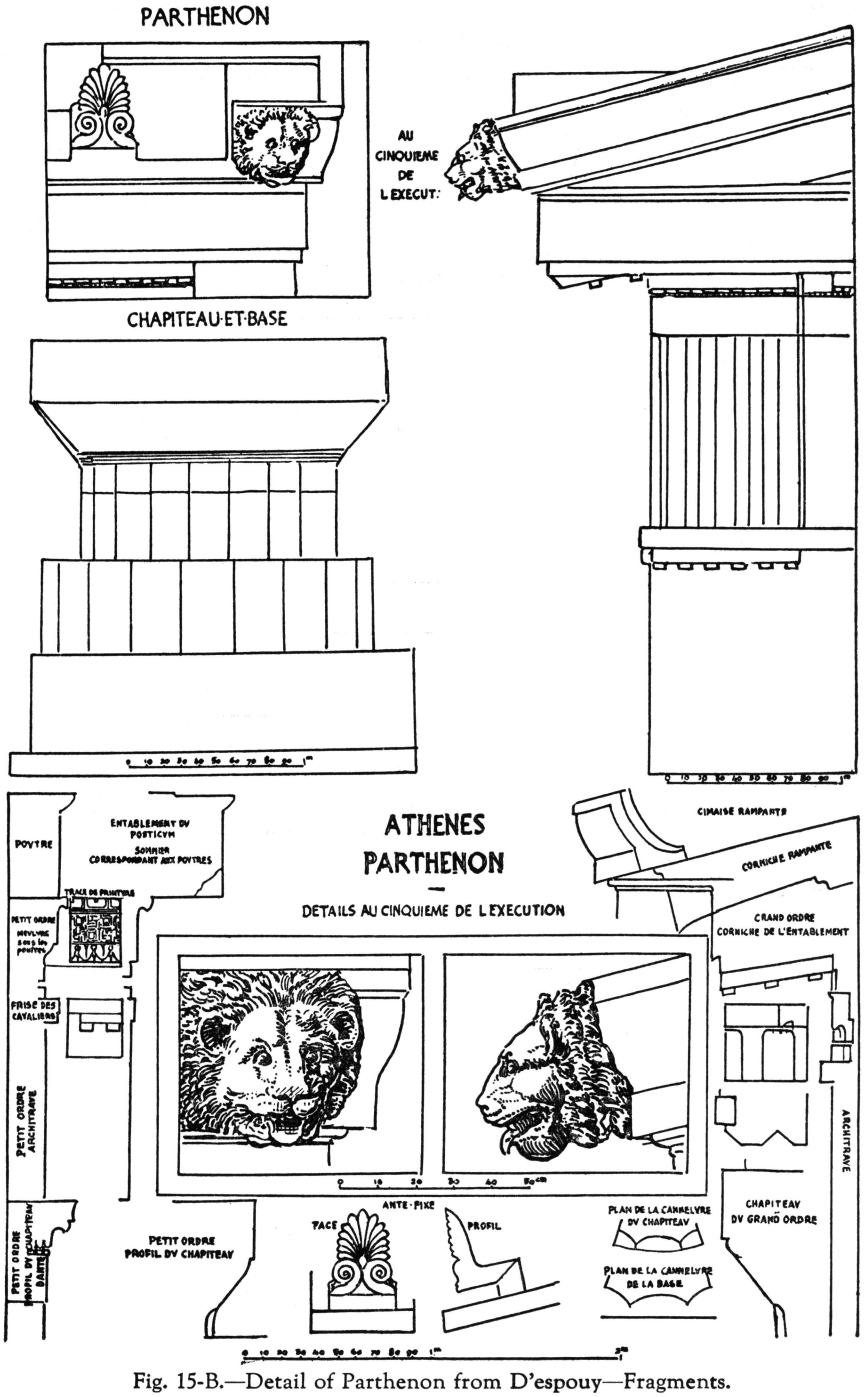


Fig. 15-B.—Detail of Parthenon from D'espouy—Fragments.

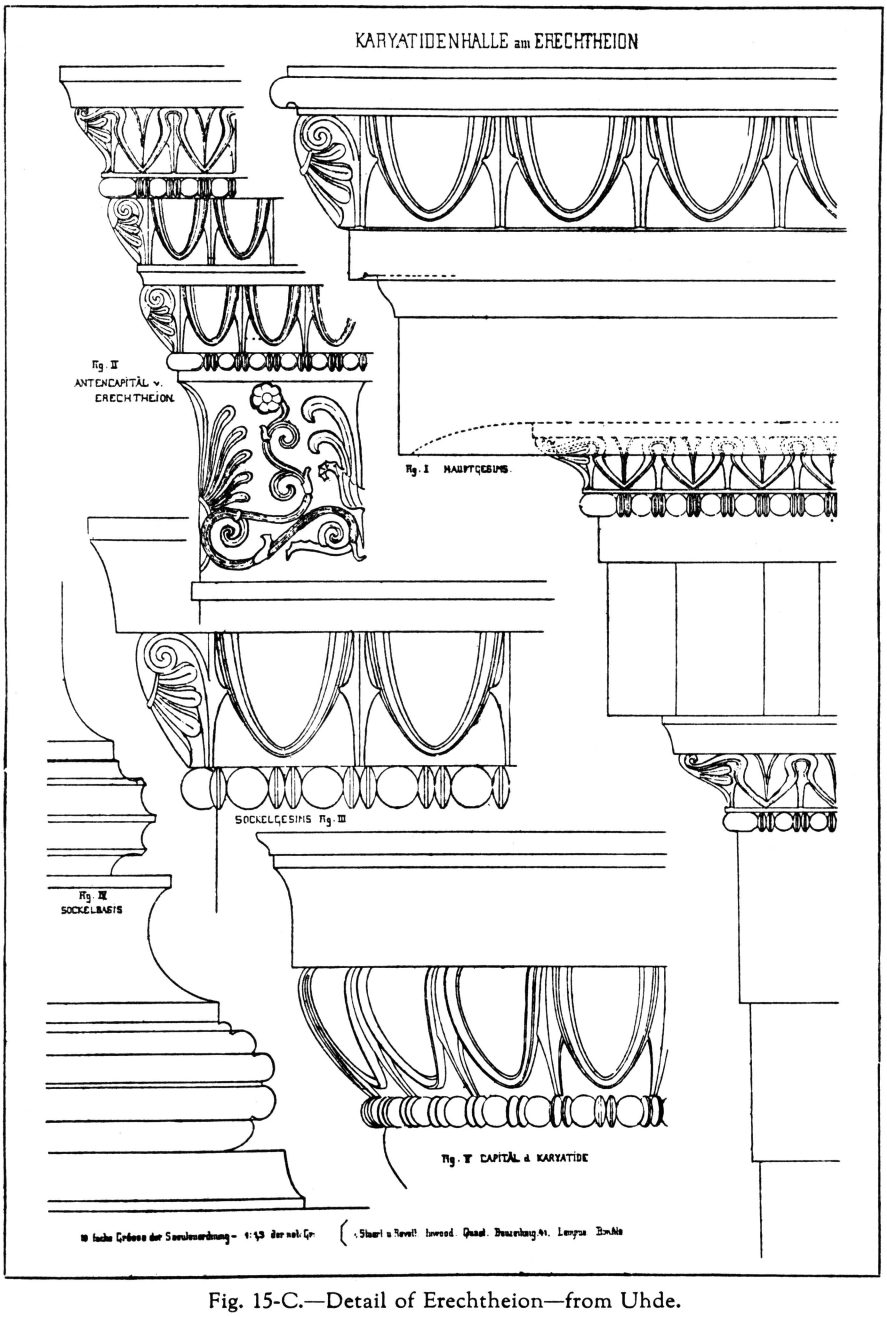


Fig. 15-C.—Detail of Erechtheion—from Uhde.

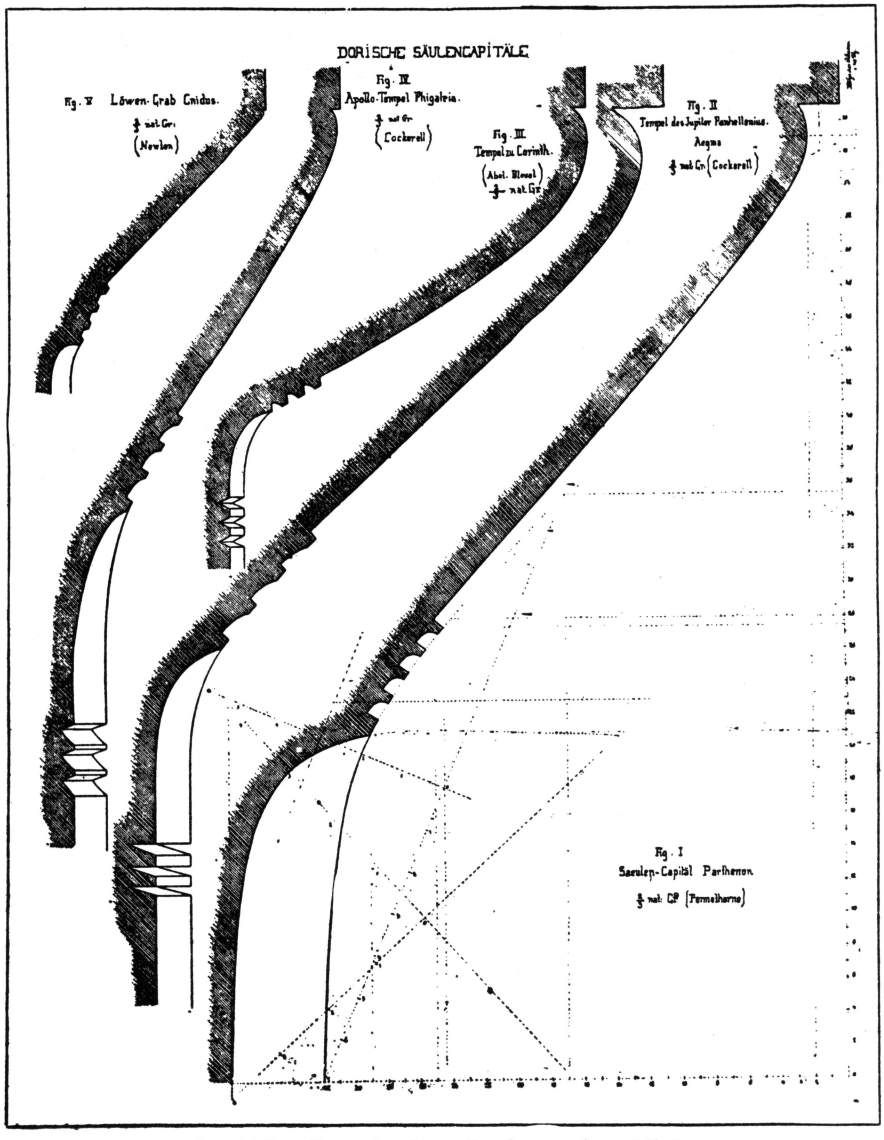


Fig. 15-D.—Doric Profiles—Parthenon from Uhde.

DEFINITION
INCISED LINES

The definition of the boundary of a moulding by an incised line was also appreciated by the Greeks, but has unfortunately fallen into disuse. It is admirable to accent small shadows and make them decisive (Fig. 16).

FIG 16

SHADOWS PRODUCED BY INCISED V CUTS
GREEK

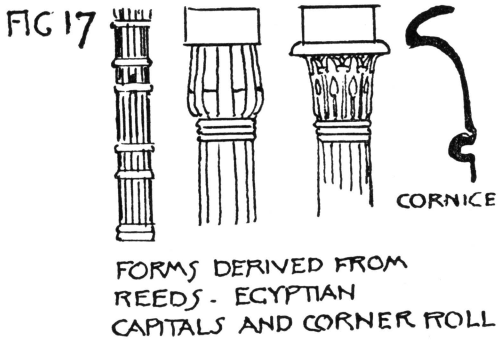
CHAPTER III.

STRUCTURAL DERIVATIONS.

Mouldings are derived from several practical exigencies of structure and if used with no consideration of their derivation are valueless.

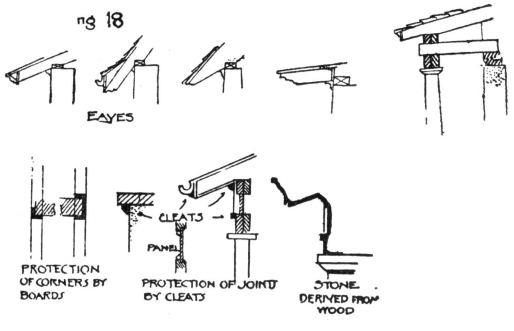
ASSEMBLING

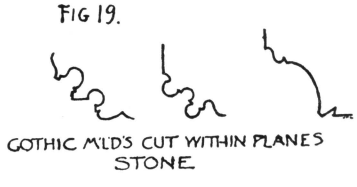
First—*From the binding together of structural parts* (Fig. 17).



PROTECTION

Second—*From the protection of joints of structure* (Fig. 18).





DEFINITION

Third—*From the definition and treatment of edges of structure* (Fig. 19), and having been created for these purposes they are at once used as follows:

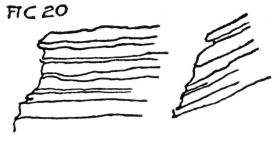
DESIGN

To define factors and motives of design (Fig. 38).

To obtain shadows in the composition of design (Fig. 2).

It is therefore obvious that mouldings result from the desire to accent structures of man's creation.

Nature has no mouldings, though in stratifications there may occur profiles which resemble mouldings (Fig. 20).



NATURAL STRATIFICATIONS

Structures when advanced beyond the elemental stage of the raw material which was formed into huts of mud, or made into shelters covered with bark and boughs or with hides, were made of the materials nearest at hand, shaped and formed to be readily used and transported.

ASSEMBLING

Buildings are constructed of factors and of parts which are assembled, and therefore there are joints between the parts which it is wise to protect, while the parts themselves must have cohesion or else be bound together (Figs. 17-18).

ARTICULATION

All structure is therefore articulated and is not a homogeneous solid, excepting in the case of poured concrete, as used by the Romans. It may be noted that concrete does not naturally develop mouldings, and that mouldings used in concrete are derivatives.

Groupings or multiplication of mouldings is usually an indication of well developed work and of skill in workmanship. Mouldings in all early types of work are at first crude, becoming simple and refined and finally complex and involved.

INFLUENCE OF MATERIALS.

INFLUENCE

In the progress of building, from the time of prehistoric men, the sequence of the use of material followed the line of least resis-

tance as determined by the ease with which material could be obtained and assembled, as follows, reeds and mud, wood, clay, concrete, stucco, sun-dried brick and burnt brick, terra-cotta, coarse stone, fine stone and metals; and as architectural forms crystallized into styles, mouldings influenced by the materials used developed into distinct types. Leather and textile fabrics being pliable have never developed mouldings.

REEDS.

REEDS

Reeds woven into mats created both horizontal and vertical striations of surface; and in sheafs and in long bundles, bound by other reeds at the ends, were used in Egypt for verticals and for horizontals, and for posts and lintels (Fig. 21) in default of the timbers of the forested regions, in which the verticals were of tree trunks, and the beams were made of split logs squared by adzes, and boards were split from logs, as in Greece and Etruria. The structures made from these materials are therefore built up of pieces and it may be anticipated that the putting together of these pieces will soon demand the use of bands, of battens, and of cleats at the joints, from which are developed all so-called classic mouldings (Fig. 18.).

CLAY.

BRICKS
VASES
POTTERY

Clay is universally used in some form, as bricks for walls, and as tiles for protective covering, etc. In all cases it develops few mouldings, excepting in the turned shapes of pottery. The bricks become rounded upon their edges to lessen the chances of injury to the edges (Fig. 22), the tiles and vase forms are thickened at their edges to strengthen them and are scored upon their surfaces to obtain texture (Fig. 23) but from structural reasons alone few mouldings develop in clay, excepting that the joints of brick walls become accented by mouldings (Fig. 24) and pottery develops individual mouldings related to mouldings upon turnings. Profiles of pottery utensils are occasioned by the purpose of the object and are of an individual and distinct class (Fig. 25).

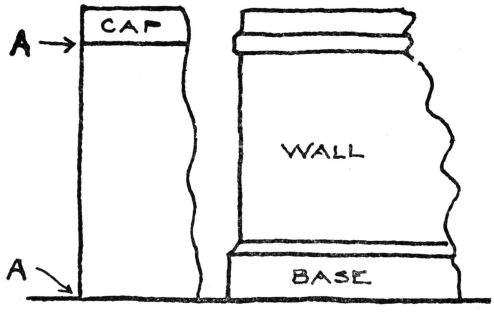
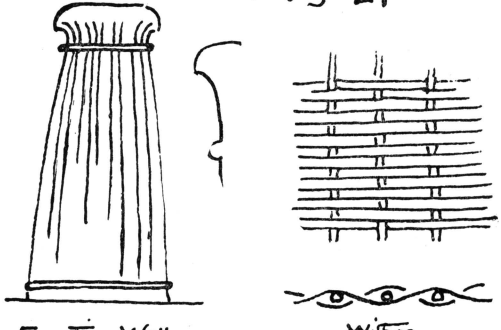


Fig 21



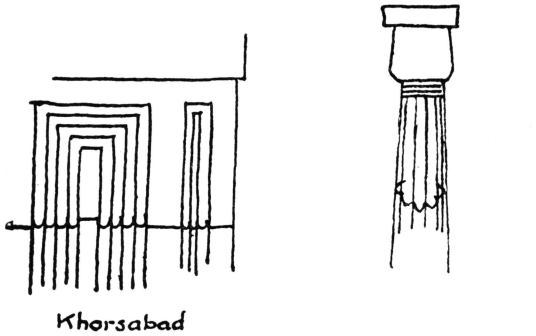
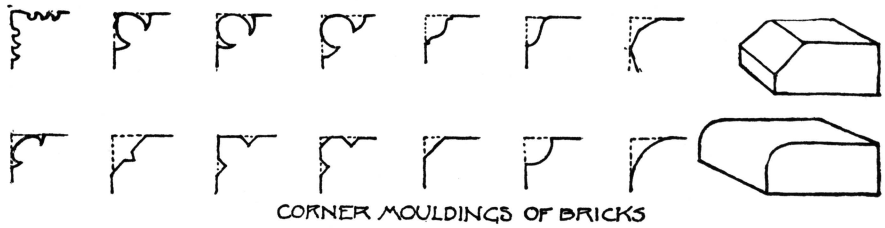
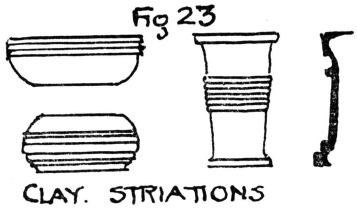


FIG. 22.



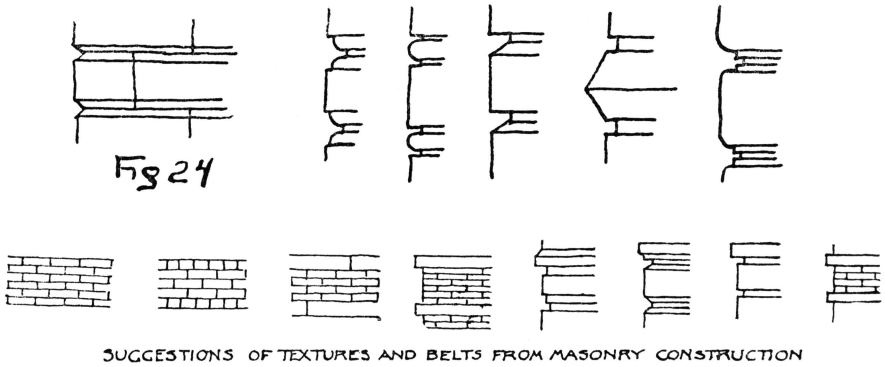
CORNER MOULDINGS OF BRICKS

Fig 23

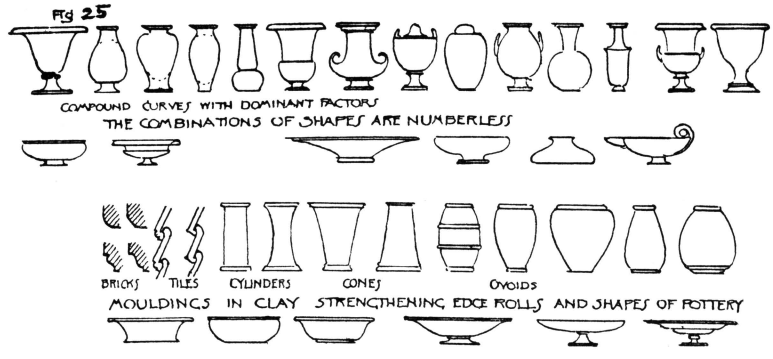


CLAY. STRIATIONS

Fig 24



SUGGESTIONS OF TEXTURES AND BELTS FROM MASONRY CONSTRUCTION



SHAPES

The mouldings which appear later in terra-cotta are either imitations of mouldings of wood or of stone, or belong to the late types used entirely as factors of design, which ignore structural derivation. They are not as robust as are those of stone. Raised strips forming dikes to retain and hold glazes may at times resemble mouldings. The turned shapes of pottery are based upon dominant factors, cylindrical, conical, spherical, ovoid, and forms with concave silhouettes (Fig. 25). The handles of pottery and glass objects are very often subtly and beautifully moulded (Fig. 26).

WOOD.

CONDE SHAPES

Mouldings in wood, from the primitive cleat to those of the most delicate type of section, depend for their development upon the character of the tools used; and progress from those which can be made with an adze and a rude plane to those made with chisels and gouges (Fig. 27) and finally to those run with a knife, either by

hand or by machine; that is they pass from the stage of planing to that of carving and machine-cutting. Refinement of the sections of mouldings therefore indicate skill in both craft and art.

FIG 27

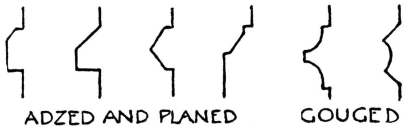
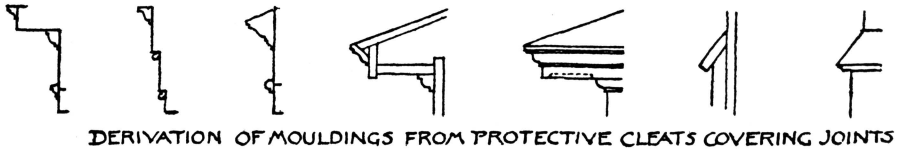
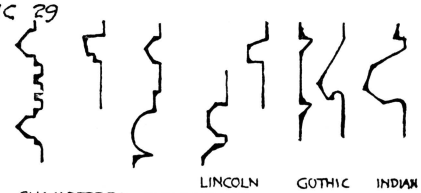


FIG 28



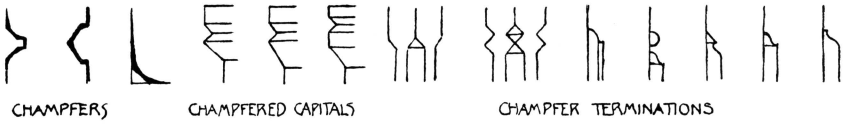
DERIVATION OF MOULDINGS FROM PROTECTIVE CLEATS COVERING JOINTS

FIG 29



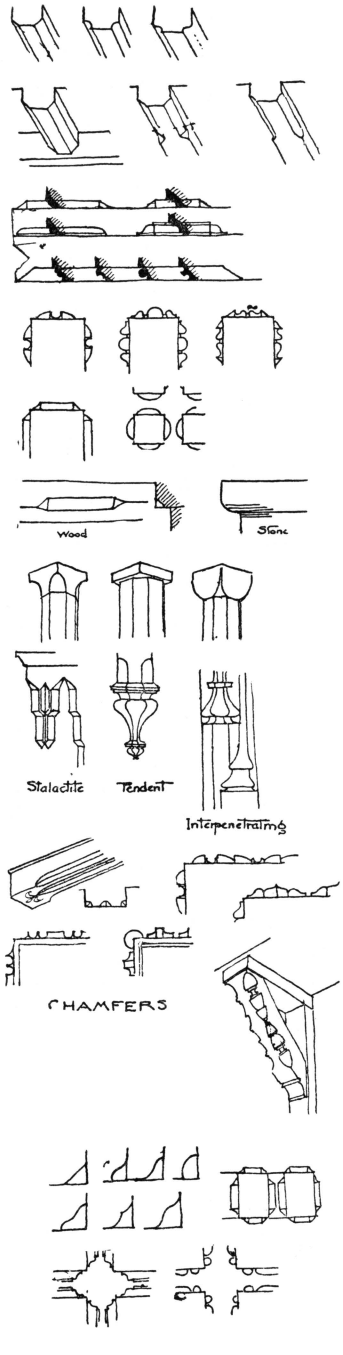
CHAMPFERED MOULDINGS

CHAMPFERED FILLETS CHAMPFERED FILLETS



CHAMPFERS CHAMPFERED CAPITALS CHAMPFER TERMINATIONS

WESTMINSTER 1066


Wood
Stone
Stalactite
Pendent
Interpenetrating
CHAMFERS

The material has long fibre and the mouldings should run with the grain, for if cut across the grain, weakness ensues.

JOINT CLEATS

Wood construction is necessarily of grouped parts, and the weakness or deterioration of the structure occurs at the union of these parts, for it is there that shrinkage and rot appear. The joints were therefore protected by covering cleats (Fig. 28) which when the orders of architecture are established fix the location of and are the root forms of the classic mouldings which project beyond the ashler faces of stone. Panel mouldings can be traced to the same source (Fig. 18).

From log construction (Fig. 75) and beam construction splays and chamfers developed, reducing angles subject to injury (Fig. 29) and projecting ends of the timber were decoratively moulded (Fig. 30). From the moulding of beam ends, modillions are derived.

Long before great skill had been attained in shaping wooden mouldings stone structure had appeared and similar mouldings imitative of those used in wood occurred.

STONE.

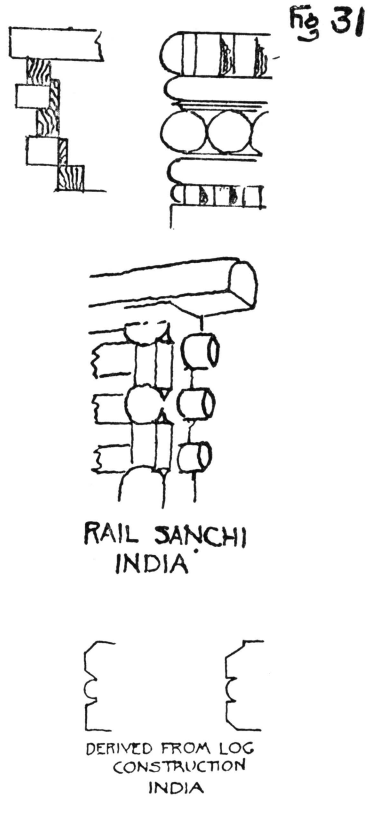
Mouldings in stone are glyptic, that is cut or carved, and belong to two distinct types.

First—chronologically, those which imitate primitive wooden shapes, which shapes, as they appear in stone, from the requirements of the material, acquire stone characteristics.

ORDERS

These are the so-called classic mouldings of the orders of Architecture, whether Greek, Roman or Renaissance; of which the persistent characteristics are that they project in front of the structural planes and surface ashlar in the same manner as wooden mouldings which are applied to surfaces, and thus plainly manifest their derivation from wood (Fig. 38).

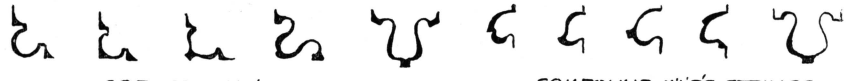
Oriental mouldings also are derived from wooden structure (Fig. 31).



CORNERS

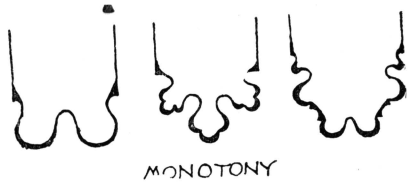
Second—The *stone mouldings which are produced from cutting inside the planes of the stone surfaces, developed from stone cutting only.* These soften salient angles, reducing them either to obtuse angles or to curves; and are intended to minimize the chance of injury to sharp angles. These mouldings occur also in wood but less frequently. They are especially evident in medieval and Gothic architecture, and develop into elaborate groups of mouldings around openings and in traceries, and as plainly indicate their stone ancestry as the classic mouldings do their wood ancestry (Fig. 32).

FIG 32



CORNER M'LD'S
GOTHIC

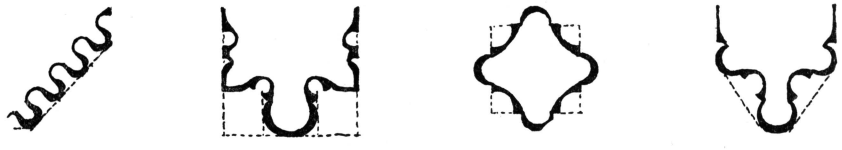
COMPOUND M'LD'S. STRINGS
GOTHIC



MONOTONY

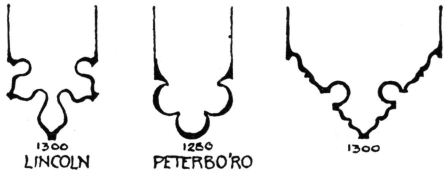
FIG 32

CORNERS



STONE PIERS

GOTHIC MOULDINGS



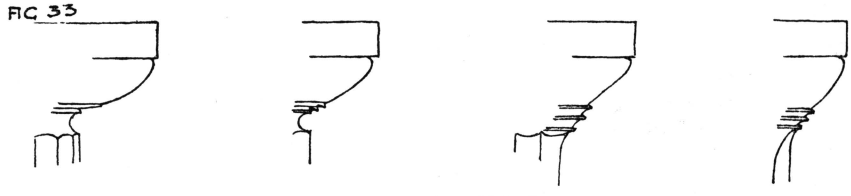
1300
LINCOLN

1250
PETERBO'RO

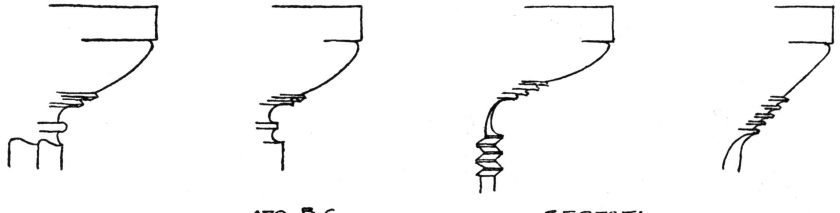
1300

FACIAL ANGLES OF GOTHIC PIERS

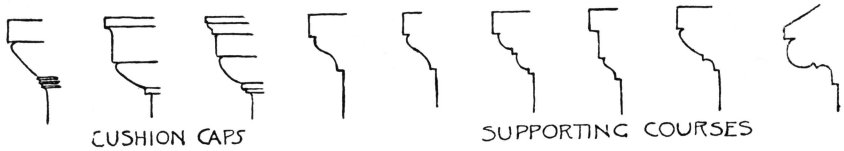
FIG 33



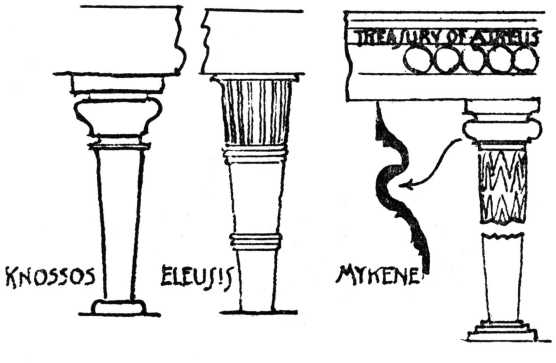
SELINUNTE 470-447 B.C.
GREEK DORIC CAPITALS



470 B.C SEGESTA
GREEK DORIC CAPITALS



CUSHION CAPS SUPPORTING COURSES

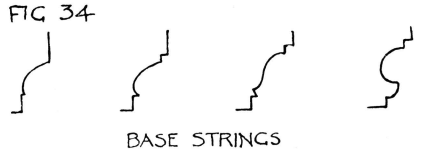


BEDMOULDS

One unique development occurs in stone mouldings, that of one or more projecting convex curves to assist the support of overhanging stones, such as eave stones, and abaci. These produce the so-called cushions of capitals, the echinus of the Greek doric capital and various bedmoulds (Fig. 33).

BASES

They also occur reversed, forming base mouldings when, by the thinning of walls, wall surface planes recede back of each other. Either advance or retreat of ashlar surfaces may occasion these mouldings (Fig. 34).



Concave bedmoulds and bases and many combinations of both convex and concave sections also occur.

TRANSITIONAL FORMS

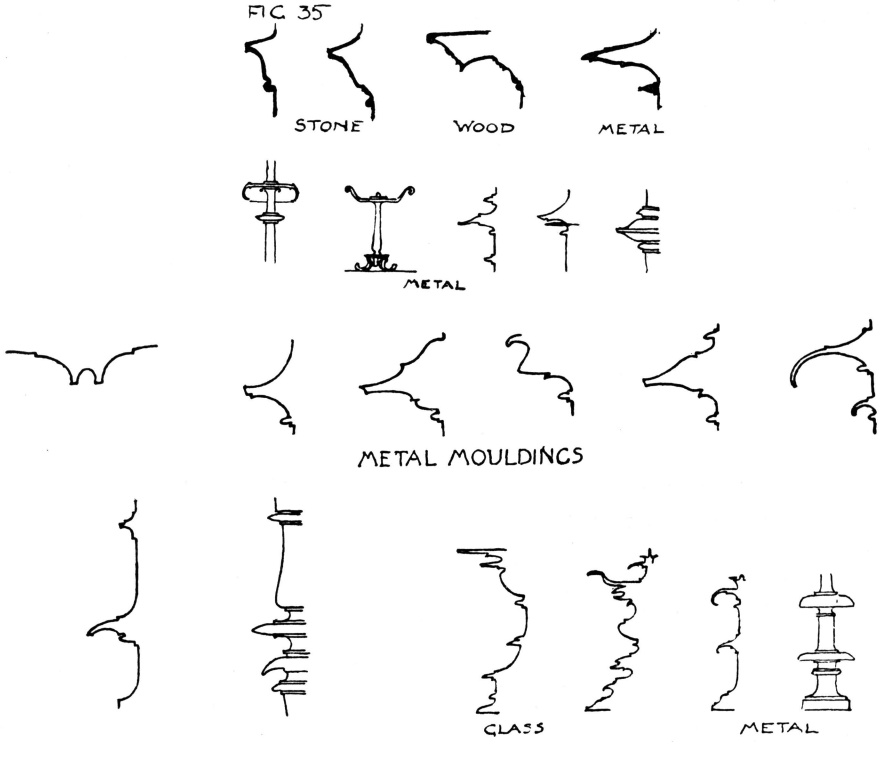
Interrelation, by commerce, by conquest, by emigrations, by invasions of alien peoples, etc., caused introduction of foreign factors into the native or established architectural work of nations, and these factors appear in the mouldings. Assyria borrows from Egypt; Greece from both; Rome from Greece, etc., until at the present day, there is a plethora of precedent often unintelligently used.

Forms of transitional periods, while creating new forms, mingle with the previous forms. Especially is this the case in Romanesque work and in early Renaissance work.

METAL AND GLASS

Metal mouldings are made of materials which, when wrought by hand, take at first the form of sheets of metal ornamented by repoussed work and incised line, and, having neither fibres nor granulated structure, but great strength, have thin edges capable of resisting injury and therefore develop thin edges in their profiles.

Glass, though fragile, has similar mouldings. Very thin metal or glass develops a straightening thickening of the edge or an edge moulding (Fig. 35).



METAL AND GLASS

Metal and glass, when mouldings are used in them imitating those of wood or of stone, as is often the case in cast work, give an impression of heaviness and of superfluous material, but if these imitative sections are exaggerated in their lateral projection they approach an expression of wrought metal.

SKILL

Mouldings of any material should not give the impression either of superfluous material or of excess of the expression of purpose. The grouping and multiplication of mouldings at salient points is usually an indication of study and of well developed styles and of skill (Fig. 90).

CHAPTER IV.

GENESIS OF TYPES.

COLUMNS.

Reeds were formed into bundles and were held together by bands of reeds bound around the ends and at intervals in their length, and were also used as vertical supports or columns. These bands were made not of one but of several parallel factors to provide adequate strength.

The effect of a series of equal parallel convex forms in the direction of the length of the bundles, crossed at right angles by a similar but less number of forms at regular intervals appeared in reed structures in Egypt. The earliest of all systems of decoration is that of a series of parallel lines of striations and these constantly recur in the treatment of surfaces.

Elsewhere these forms become traditional and conventionalized, persistent, and are repeated in wood and stone structure (Fig. 36).

CAPITALS.

BUD CAP
BELL CAP

At the top of vertical columns and walls of reeds the long delicate ends beyond the last binding are then tied in at the top and produce the profile of the bud capital of Egypt. If they are not tied, but are merely loaded by a clay finish at the top of the structural feature, they bend over in the concave shape of the Egyptian cornice, and of the bell capital (Fig. 17).

When in the progress of advance in civilization requirements of religions and of governments demanded greater permanency and dignity in buildings and they were built of stone, the forms of the earlier primitive wooden structures were cut in the stone; and the walls and columns of the Egyptian buildings were frequently decorated with vertical convex mouldings resembling reeds; the corners of pylons and the top of pylon walls immediately below the cornice were strengthened by roll mouldings formed of bundles of reeds bound also at regular intervals by reeds, and the cornices themselves took the concave delicate curves of the tops of reeds bending

under weight, which shapes also appeared in the bell caps of the 17th and 18th dynasties (Fig. 17).

Clay, excepting in pottery, and concrete, as already stated, created few mouldings; a thickened rounded edge alone occurring early, but in later use all types of mouldings were imitated in clay and in concrete and stucco. *The great majority of mouldings are developed from wood and from stone.* Parallel striations upon utensils to give grip to the hand suggested a variety of low relief flat band mouldings (Fig. 23).

APPLIED MOULDINGS

Mouldings developed from wood are in most cases applied to the structure, i. e., project in front of the wall surfaces, while those developed from stone are, unless derived from wooden mouldings, as in classic work, cut within the planes of the stone blocks.

STRUCTURE IN WOOD.

FACTORS

The structures of wood have universal, elemental factors, i. e., posts, studs, lintels, beams, and rafters, made of tree trunks used first in the circular natural form, later in squared timber, and in split timber, i. e., beams, planks and boards. The structure is therefore of grouped parts, and its vulnerable points are at the union of these parts, for there deterioration sets in from shrinking and from moisture, hence the use of cleats to cover the joints.

All structure presupposes stability, and acknowledgment of the law of gravitation.

POSTS

The posts are erected vertically, the lintel or plate is laid upon them horizontally, the ceiling joists are laid horizontally, and the rafters are laid to the pitch requisite to shed rain or snow (Fig. 18). Walls and roofs are covered with boards or with terra-cotta or stone plaques and tiles, or with metal.

The materials being laid upon each other, most of the joints are therefore horizontal.

When walls are built of clay or of sun-dried brick, the protecting roof is still of wood, as is the outside columned peristyle built to protect the clay cella walls (Fig. 18).

Because of straight timber, especially of board coverings, the buildings take rectangular plans, instead of the circular tent plans.

JOINTS AND CORNERS.

JOINTS
CORNERS

Two places in these structures demand special protection.

First the horizontal joints, second the vulnerable edges of corners.

Both are protected by small strips of wood, or by cleats (Fig. 18).

None of these elemental wood buildings still exist, but stone derivations from them do exist in Cretan and Greek buildings, and modern elemental buildings are constructed in the same manner.

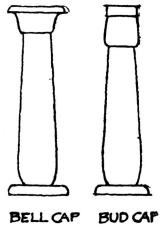
VERTICAL TYPES.

The verticals are posts, piers and columns. The stone columns in the Megaron, or large room, the audience hall of the king's palace at Knossos, and the column at the entrance of the tomb at Mykene, are larger in diameter at the top than at the bottom and are evidently derivations of trees driven as piles, with the small end down (Fig. 33-a).

VERTICALS

The Egyptian column derived from sheaves or bundles of reeds were naturally larger at the base than the top (Fig. 36).

FIG 36



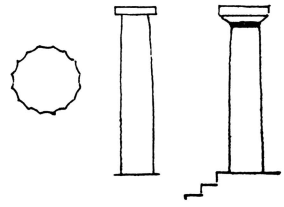
BELL CAP BUD CAP
EGYPT

The Greeks adopted this form as indicating greater stability and erected the tree trunk as in nature, with the small end upwards.

Pausanias, writing 130 A. D., states that there were at that time two oak columns in the Heraion at Olympia.

The Egyptian columns developed convex flutes from reed antecedents, or working in stone shaped the square pier which antedated the columns into an octagon, and recutting it to 16 sides, as at Beni Hassan, created for the first time, a stone derived moulding, and by hollowing the planes, to accent the vertical edges or arris, produced the concave flute which the Greeks adopted in the Doric style (Fig. 37).

FIG 37



BASE DISCS

(Note that frequently the early wooden columns were set upon a circular wooden disc or base to obtain an even bearing upon the earth and that the Creton columns retain this disc in stone (Fig. 36), but the Greek Doric order, the earliest classic order of Architecture in which the columns are built in drums, upon a level stone platform or stylobate on which these columns have a secure foundation, has no bases to its columns.) (Fig 37.)

ABACUS

At the top of the tree trunk, to obtain a level bearing for the lintel, a squared piece of plank was placed, the abacus.

End wood was always considered unsuitable for bearing surfaces. The plank created the so-called abacus and was repeated with greater thickness when of stone, both in Egypt and in Greece. The cushion between the top of the columns and the abacus which later developed into the convex Echinus (shell) of the Greek Doric, is of uncertain derivation, and has caused much speculation. As it is exaggerated in Crete and without an abacus, it may have been the repeat the top of the column of the disc at the bottom for a similar purpose (Figs. 33, 36).

ENTABLATURE.

Few mouldings developed at an early date in connection with columns or shaft.

Above the columns is the so-called entablature of the classic orders of architecture, in which most of the mouldings developed. At first they were merely cleats covering and protecting ill fitting joints, and for utilitarian purposes only. They developed in the early Greek temple, which consisted of a rectangular cell, with walls of clay or of sunburnt brick, surrounded by wooden columns set away from the wall, so that the roof extended not only over the cella but beyond it over these columns and the wall was protected from the rain.

LINTEL

A beam or lintel lay upon the columns parallel to the plan lines of the cella, i. e., the peristyle of columns. At right angles to this beam, and double in number to the columns, beams were laid with one end on the lintel and the other supported by the cella wall, or else carried across the cella; on top of these beams was laid a plate corresponding in plan lines with the lintel below. On top of this plate, and at right angles to it, and four times the number of columns, were placed the rafters, projecting beyond the plate to protect the wood below from rain. The ceiling beams made of three beams side by side showed end wood, and later developed into the Greek Doric triglyphs (three cut) (Fig. 38).

TRIGLYPHS
METOPES

The spaces between the ends of these triglyph beams, approximately square in shape, were filled with boards, upon which designs or devices were painted and carved, and which later became the sculptured metopes.

The ends and under sides of the projecting rafter ends were covered with boards, this under side being called a planceer or a soffit. The under side of the ceiling beams were also boarded.

CLEATS

The horizontal joints were between the top of the lintel and the under side of the ceiling joists, and between the top of the ceiling joists and the under side of the projecting rafters. At both places simple cleats were put to cover poor joints and later to accent struc-

ture. The lower cleat became the tenia, the upper the bedmould. *The tenia, at the adjacence of two surfaces upon the same plane, never became important.*

BEDMOULD

The bedmould, under the projecting factor of the cornice or eaves, when structure in stone appeared, exercised in addition to its original cause and in excess of it, *an assisting element of support to the overhanging stone of the cornice and developed rapidly into an elaborate grouped moulding,* deepening, pushing forward, and having associated with it brackets or modillions until it became the richest moulded element in the classic entablature. (Fig. 38).

Note, that in stone structure, the less the projection of the eaves, the less need of the importance of the bedmould.

CROWN

There remains the top or crown mould, or gutter mould. At a very early date, this may have been merely half a split log, hollowed. The only reason for this supposition is that primitive pioneer buildings of back woodsmen sometimes have gutters of this description.

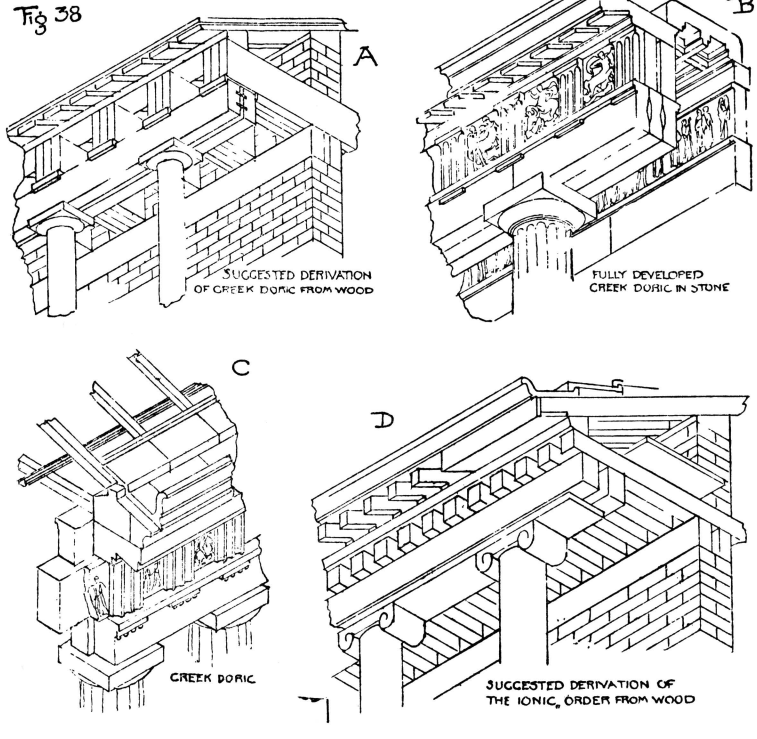
Long terra-cotta concave tiles were similarly used, collecting the roof water in order that it should not drip but pour out of apertures left at regular intervals so that it should shoot away from the building. This gutter moulding would therefore have, at first, a convex shape, and it is not developed as much as is the bedmould, though it is naturally larger than the tenia. These are the elements from which classical mouldings have been derived.

CHAMFERS

One other type of wood mouldings occurs, which influences mouldings generally to little extent, that is, the planing of the edges of squared timber to prevent the slivering of a right-angled corner. These mouldings are called chamfers and are in a class by themselves and do not occur in classic entablatures. Moulded terminations to chamfers occur which increase their interest (Fig. 29).

The initial forms, both of structure and of mouldings, of the Greek Doric order were thus determined in wood, and have become traditional, and were translated into stone by the eighth century before Christ, and from the desire to make the temple the most worthy of all buildings, aesthetic refinements appear at once in the stucco, which covered inferior materials, and in the stone.

Fig 38


A
SUGGESTED DERIVATION
OF GREEK DORIC FROM WOOD
B
FULLY DEVELOPED
GREEK DORIC IN STONE
C
GREEK DORIC
D
SUGGESTED DERIVATION OF
THE IONIC ORDER FROM WOOD
E
IONIC

THE ORDERS (Figs. 38, 90).

DERIVATIVE

The classic orders were derived from the structure which has been described, and consist of columns carrying an entablature, which entablature is composed of three parts; first, the horizontal beam, epistyle, or architrave, bearing directly upon the columns; second, a frieze, with or without triglyphs, on the same vertical plane as the architrave, and occupying the height of the cross beams which were carried from the top of the architrave to the wall; and third, the projecting cornice occasioned by the projecting rafter ends (Fig. 38).

The column is divided into three parts, the base, shaft and capital.

The Architrave at first undivided, becomes divided into two, and finally into three parts, and the cornice is divided into three parts, the bedmould, the facia and the cyma or gutter mould.

ARCH

At each of the divisions and subdivisions, occur one or more mouldings proportional in their importance to the change in the structural factors. For instance, where the vertical shaft meets the horizontal beam is to be found the most elaborate decorative detail, i. e., the capital, which is often replete with mouldings; where the plane of the cornice advances considerable in front of the plane of the frieze occurs the bedmould, which is often an elaborate group of mouldings (Fig. 90). But the subdivisions in the planes of the architrave are only expressed by small and delicate beads. Early Classic arch mouldings resemble those of the architrave, the arch being considered as a bent beam.

Beams became heavy stone beams and architecture was at first expressed in what is known as trabeated architecture, devoid of arches, and with its structural elements and its accented lines horizontal and vertical.

The horizontal accents of structure are especially expressed by mouldings which, in stone, develop curved profile as a refinement at an early date.

The effect of mouldings is to create lines of shadows and of shades, defining both structure and design. Shadows upon planes are even in tone; shades and shadows upon curved surfaces are

graded in tone. The definition of the edges of mouldings depends upon the crispness of the shadows.

v. CUTS

This was recognized by the Greeks, who constantly inserted incised lines between the moulding and the plane upon which it was set. Similar in-cuts occur in developed Gothic mouldings, but seldom elsewhere, minor beads and fillets between major mouldings and planes being substituted (Fig. 59).

CHAPTER V.

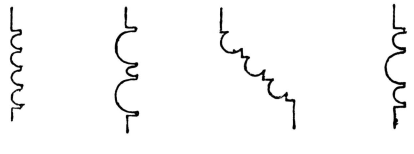
EFFECT OF MOULDINGS.

As mouldings are essentially decorative in character, the general laws which apply to decorative design will be found to affect them.

As an even shadow tone is desired, in order that the mouldings shall not disturb the apparent stability of their background, each should evenly follow the surface upon which it is placed.

In grouped mouldings, each group should be compact and thoroughly defined upon at least one of its outer edges, and monotony of treatment, i. e., the repetition of equal similar mouldings side by side, should be avoided excepting where the mouldings are performing very simple functions, such as expressing texture. (Figs. 9 and 39).

FIG 39

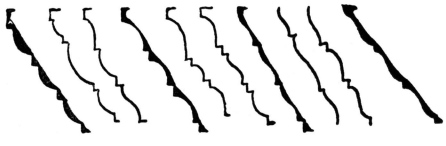


SIMPLE BEADS

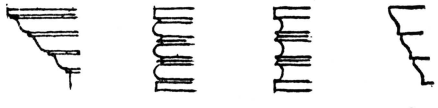
Monotony in effect of grouped mouldings is produced more frequently by adjacent mouldings of similar sections and of varying widths than by those of dissimilar sections and equal widths (Fig. 40).

It is sometimes desirable to use mononoty as a foil to extreme complexity or brilliancy.

FIG 40



MONOTONY
REPETITION OF IDENTICAL MOULDINGS



REPETITION OF IDENTICAL PROFILES

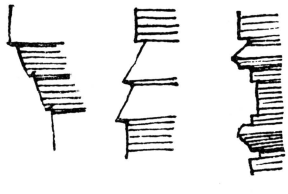
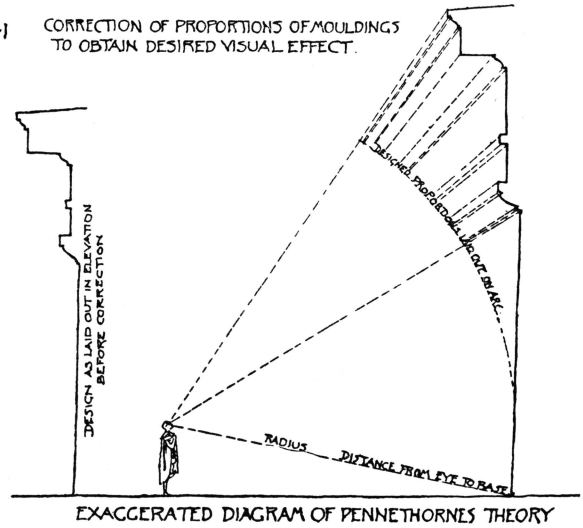


FIG 41 CORRECTION OF PROPORTIONS OF MOULDINGS TO OBTAIN DESIRED VISUAL EFFECT.


DESIGN AS LAID OUT IN ELEVATION BEFORE CORRECTION
DESIGNED PROPORTIONS AS SEEN AT ANGLE
RADIUS
DISTANCE FROM EYE TO BASE

EXAGGERATED DIAGRAM OF PENNETHORNES THEORY

It is usually well, however, to have one moulding dominate all others of its group.

ILLUMINATION

In exterior mouldings, effects are studied to be produced by the direct rays of the sun; therefore, the light is assumed to be above the moulding, and for the objects of study, in architectural rendering, is assumed to be at an elevation of 45° diagonally at the left of the object lighted. This is in order that the shadow may indicate by scale the exact projection of the plane casting it in front of that on which it is cast. The light then illuminating all parallel planes equally (unless they are in shadow), these planes reflect the light equally. *Grouped mouldings in full light should be studied as to the effect of their mutual planes* (Fig. 13).

It follows that to produce a harmonious effect in the series of mouldings upon a building, that all similar sets should be designed in parallel planes (Fig. 13). This is so well established that classic entablatures in academic work are conventionally designed in planes of 45°, and all minor mouldings above the eye are influenced by the same plane.

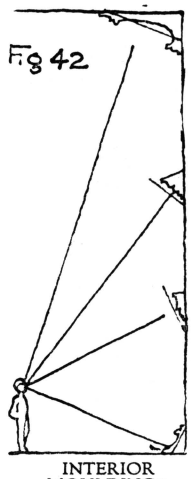
FACIAL ANGLE

This determines what may perhaps be called the facial angle of grouped mouldings, i. e., the angle of the plane in which they are contained (Fig. 13).

Apart from this general fact in regard to the illumination of similar planes, the general planes of grouped mouldings are subject to the point of view of the observer.

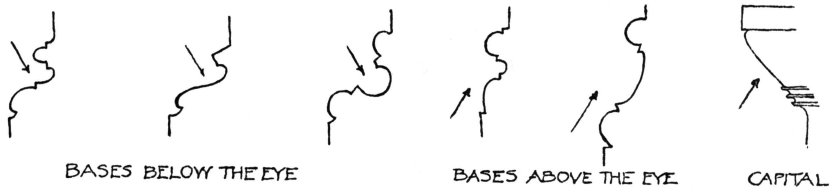
It is assumed that architecture is intended to be viewed from near the base plane of the building or architectural form. Therefore, the plans of mouldings, to be most effective, must approach a right angle to the line of vision, consequently the planes of mouldings above the eye lean forward, while those below the eye lean backward. These latter are few, in most cases bases. This applies primarily to interiors in which the observer's point of view is near at hand; upon exteriors, a genial facial angle to all mouldings is sufficient.

It is to be noticed that when these base forms are repeated above the eye, their angle more nearly approaches the vertical, and in some cases, does so absolutely, and the base forms are thereby heightened.



INTERIOR MOULDINGS

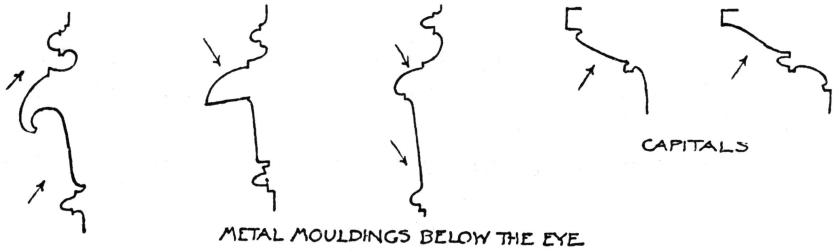
ARROWS INDICATE THE DIRECTION OF VISION -



BASES BELOW THE EYE

BASES ABOVE THE EYE

CAPITAL



CAPITALS

METAL MOULDINGS BELOW THE EYE

For this reason, the facial angles of base mouldings vary much more than those of entablatures, cornices and belt courses.

CONTRASTS

As mouldings are defined primarily by their shadows, it follows that the greater the contrast between the surfaces which are in light, and the shadow, the more effective the mouldings, and it therefore follows that mouldings are at their best in light colored materials. Also, as it may be assumed that upon exterior work, shadows are produced by an overhead sun, horizontal mouldings in direct sunlight create the shadows which best accent the design and of which the parallel lines of shadows require the most careful study.

EFFECT

The effect of a building is obtained first by the relative proportions of its geometric solids; second, by the positions and relative proportions of its voids to its solids; third, by the arrangement and relative proportions of its planes to each other, as announced by tone and shadows.

HARMONY

Absolute harmony of surface tones is disturbed by the adoption of planes which are not parallel to each other. It follows that the planes used in classic mouldings are usually parallel (Fig. 13).

The same element of harmony exists in the mean confining lines of projecting curved mouldings, single or grouped, this mean being uniform above the eye (excepting in bases), and *creating a general facial angle common to all mouldings upon the facade of a building* (Fig. 13).

FACIAL ANGLES

Facial Angles—This angle of the containing plane in Greek work was often flatter than 45°, which tended to make the individual moulding planes in Greek grouped mouldings wider in proportion to the curved factors than in later classic work, in which the facial angle was usually 45°.

It is of the utmost importance in exterior work, that the "facial angle" be maintained throughout, otherwise the harmonic entity of the building will be injured.

Greek architecture is restrained in the use of mouldings (Fig. 15).

Upon interiors, as the direction from which the light proceeds is from various points, the facial angle is not of as great importance, but is, nevertheless, always of value.

There can be assumed in interiors, a curve struck from a point six feet above the floor with a radius of the greatest length of the room, or, if desired, of the width of the room or even less, which curve will be the defining line of the facial angles of the mouldings. In this case, it is obvious that the cornice mouldings will lean in towards the observer, which is desirable, and all the facial angles will have a harmonic relation (Fig. 42).

A dominant use either of concave or of convex mouldings is also a harmonizing factor (Fig. 8).

It is evident that mouldings should be primarily studied for their effects or shades and shadows, not for their profiles. Similar effect can be obtained by very different profiles, but the more refined and subtle profile is always preferable.

SHADOWS

The first study is therefore that of an arrangement of parallel lines of shades and shadows of varying widths and intensities, then of the profiles, which will give these results (Fig. 2.)

ALTERNATION

As absolute repeated uniformity, whether in lines, color, shapes or tones produces monotony, and contrasts are desirable, alternatives of concave and convex shapes, or simple, and of compound curves and planes are essential in designing interesting mouldings and their shadows, a dominant, however, being necessary to pronounce major intention. This is true of all mouldings.

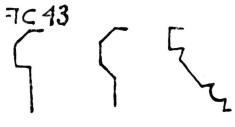
CHAPTER VI.

THE NOMENCLATURE OF MOULDINGS.

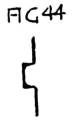
Moulding—The plane or curved surface formed upon the face of a piece or member of structure by shaping the material so as to produce light and shade and shadow, and is generally understood to mean that the section of the said surface is prolonged uniformly to a considerable extent in one direction.

SIMPLE SECTIONS.

Bevel—An even surface, of which the plane is not parallel to the plane of the structural factor on which it is cut (Fig. 43).



CRUDE STRINGS



FILLET

Fillet—A relatively small moulding of rectangular section, with its vertical and horizontal planes equal, or with the vertical surface the broader of the two, also used to define the small arris between mouldings in Gothic work (Fig. 44).

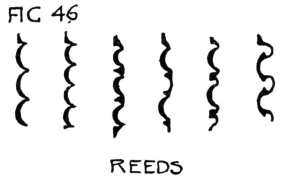
Bead—A convex—rounded moulding—usually of semi-circular section and usually associated with a fillet. A projecting moulding (Figs. 45-39).

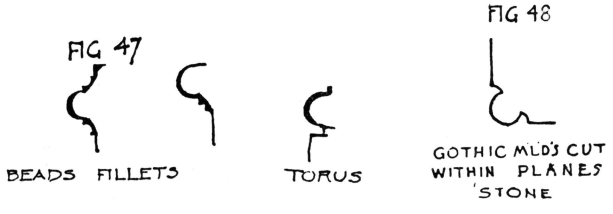
CONVEX

COMBINATIONS BEADS FILLETS CYMAS

BEADS FILLETS & HOLLOWS

Reed—Similar to bead, but occasionally back of surface. Repeated beads produce texture (Fig. 46).

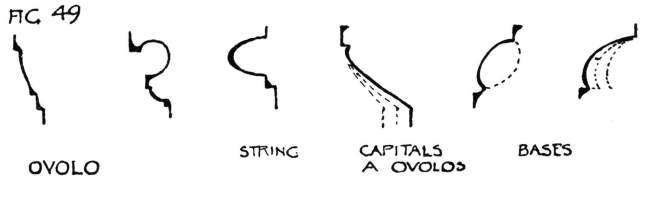




Torus—(Rope)—A large bead. Opposite of Scotia (Fig. 47).

Roundel—A large bead upon a corner angle (Romanesque and Gothic) usually a moulding cut back of the structural planes (Fig. 48 and 69).

Ovolo—(Egg Shaped) convex rounded moulding approximating a quarter round—as the Echinus of a Doric Capital (Fig. 49).



Cavetto—(Hollow) A simple concave moulding, usually a quarter round, as distinguished from a Scotia, which is more than a quarter round. Also called Cove—opposite to an Ovolo (Fig. 50).

Flute—Shallow or deep concave or groove cut back of surface (Fig. 51).

Repeated flutes produce texture.

Congee—(Departure) A cavetto flowing from and terminating a straight line—also occasionally called an Apophyge (Fig. 52).

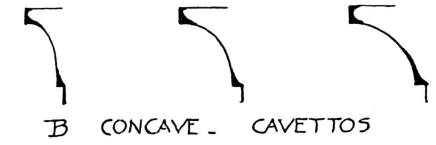
Scotia—(Dark) A concave moulding of more than a quarter round in section. Opposite to a Torus. In Gothic work, Scotias became deep hollows, contrasting with accenting projecting mouldings (Fig. 53).

MOULDINGS OF COMBINED CONVEX AND CONCAVE FACTORS.

Ogee—of an S-shaped section—shallow or deep, the convex and concave factors can exceed a quarter round (Fig. 54).

Cyma—(Wave) A moulding of Ogee section consisting of a combined convex and concave curve (neither exceeding a quarter round or a quarter of an ellipse), or having conic section curves flowing into each other. If the concave curve is at the top of the moulding, it is called a Cyma Recta; if it is at the bottom, a Cyma Reversa (Fig. 55).

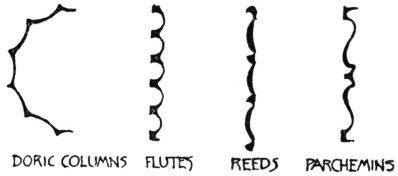
FIG 50



B CONCAVE - CAVETTOS

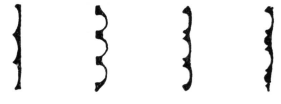
B CONCAVE - COVES

FIG 51



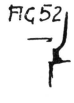
DORIC COLUMNS FLUTES REEDS PARCHEMINS

TEXTURE AND TONE PRODUCERS



FLUTES

FIG 52



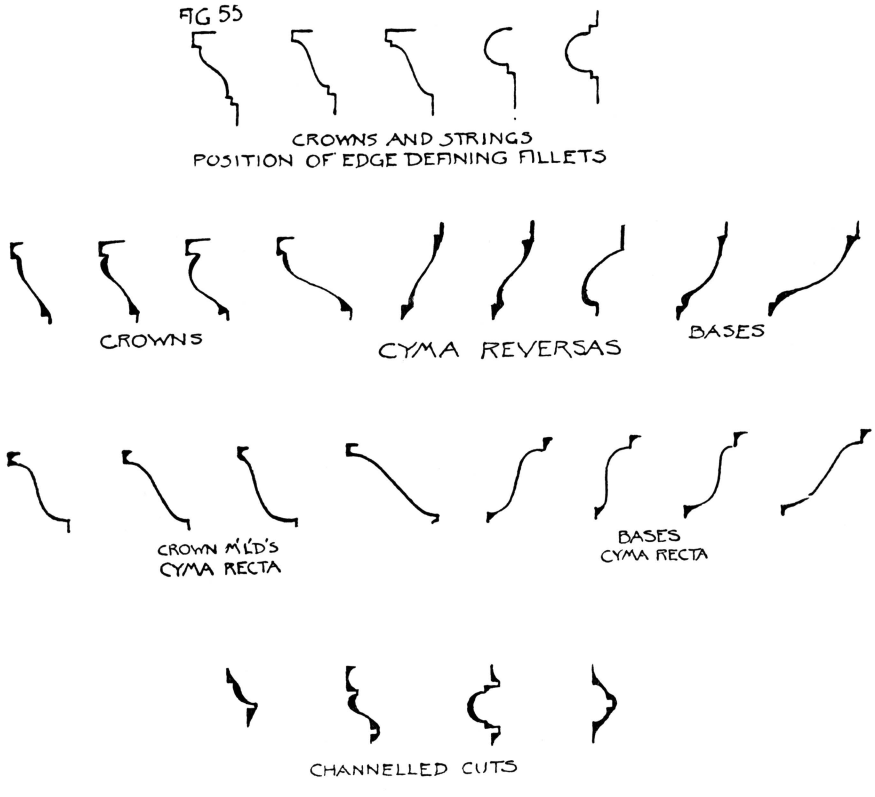
CONGÉ

FIG 53

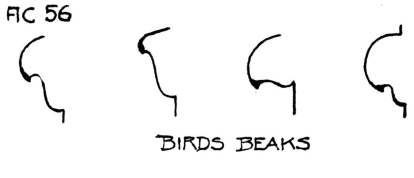
B CONCAVE _ SCOTIAS

FIG 54

OGEES

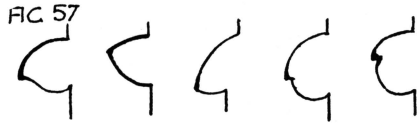


Bird's Beak—A projecting moulding with its top factor a reversed ovolo, and its lower factor a cyma recta (Fig. 56).



Bowtell—A moulding, symmetrical, of two opposed ovolos meeting at a point, or with a fillet inserted between them (Gothic) (Fig. 57).

FIG. 57



BOWTELLES

Lamb's Tongue—A moulding of considerable projection as compared to its width, of two opposed Ogees separated by a fillet (Gothic) (Fig. 58). Other combinations occur.

FIG. 58

LAMBS TONGUES

LAMBS TONGUES

CHAPTER VII.

ANALYSIS OF SHAPES.

MOULDINGS OF PLANES.

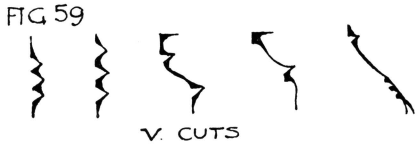
BEVELS

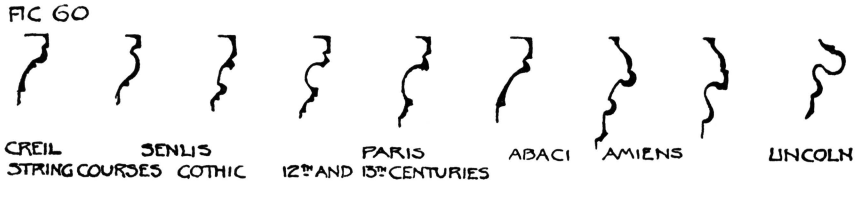
The use of Bevels only gives a mechanical appearance, as do chamfers unless they have decorative ends (Figs. 43 and 29).

FILLETS

Square-edged strips of rectangular shapes used alone, or in combination with curved mouldings to define edges of such mouldings, correspond with conjunctions in grammar, and are always auxiliary, and should be of smaller scale than the mouldings associated with them. *Their projection should never be more than their faces.* They give a clean-cut, definite shadow, without graduation (Figs. 12-44). They are clarifying factors in developed work, the incised cuts of Greek Doric alone performing similar functions (Fig. 59).

The simplest of mouldings are the strips or fillets, or their opposites, channels (Fig. 44). These are mere bands of greater or less width or projection, or depression, and occur single or in groups. They may have their surfaces at any angle to the plane of the background upon which they are placed (Fig. 60). The plane of the principal surface of the mouldings is entirely influenced by the tone value of light desired.



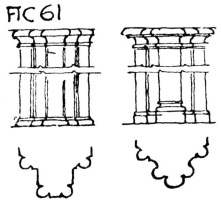


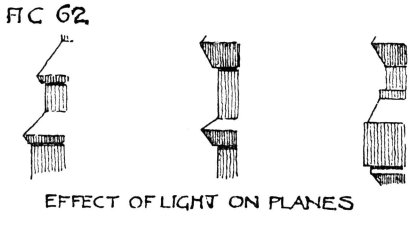
In the case of wood and stone fillets, the projection is usually less than the face of the moulding, the object of the moulding being solely to produce a line of shadow equivalent to its projections. This shadow varies under different conditions of light.

The same effect can be obtained by a channel as by a fillet, but the shadow is more intense (Fig. 55).

If the entire moulding is to appear lighter than its background, the face is inclined upward; if darker, downward (Fig. 56).

Shadow can be made more sparkling and brilliant both by inclining the face upward above the shadow, and by channelling the shadow (Fig. 62).





The value of plain fillets is entirely that of simple lines of defining shadow, more or less softened or intensified by the treatment of the planes. When grouped, such fillets correspond with the simplest forms of decorative bands or belts, and are placed at regular or cadenced intervals, as are the belts or border lines of primitive decoration.

Variety can be obtained by differences of projection as well as of width of faces.

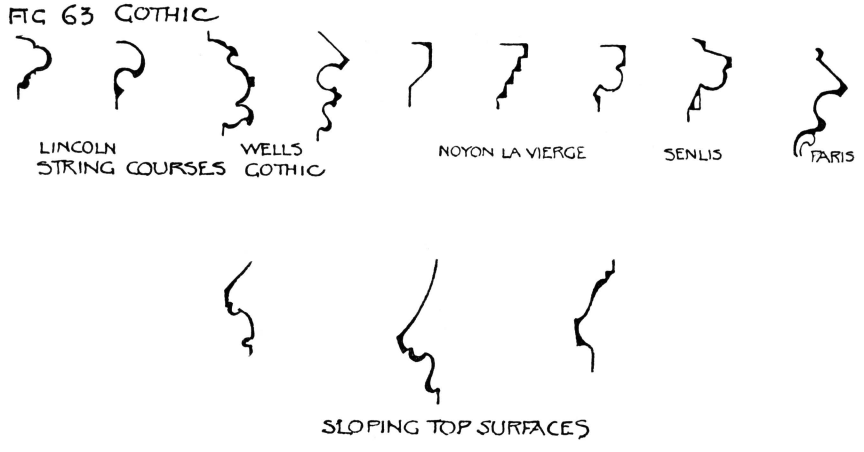
In many cases, the top surfaces are slightly beveled to shed water or prevent accumulation of dirt (Fig. 63).

FILLETS

Fillets, as principals, make admirable borders and divisions between portions of surfaces in one plane. These are much more frequent in Oriental work than elsewhere, and form the major part of the Mohammedan system of moulding.

As auxiliaries, the fillets are the conjunctions of the grammar of moulding, connecting otherwise poorly related forms.

In softening the corners by chamfering or rounding, these mouldings become more complex and more difficult to handle. The chamfered fillet has many variations (Fig. 29).



As soon as a moulding becomes complex in its parts, it has sufficient individual character to be used alone; and it does not gain by repetion of itself, which produces monotony (Fig. 9). *Quality takes the place of quantity.*

For this reason the chamfered fillet is used single at divisions of surfaces in the same plane: i. e., as a string course, astragal or border, accenting changes of material or of texture.

The chamfered fillet is frequent in Oriental work, and in transitional and crude forms of the Romanesque and of the Gothic (Fig. 29). It is more often of stone than of wood, and is rare in metal.

A beveled or champfered wash or top surface is common to all styles of architecture, and is structural (Fig. 64).

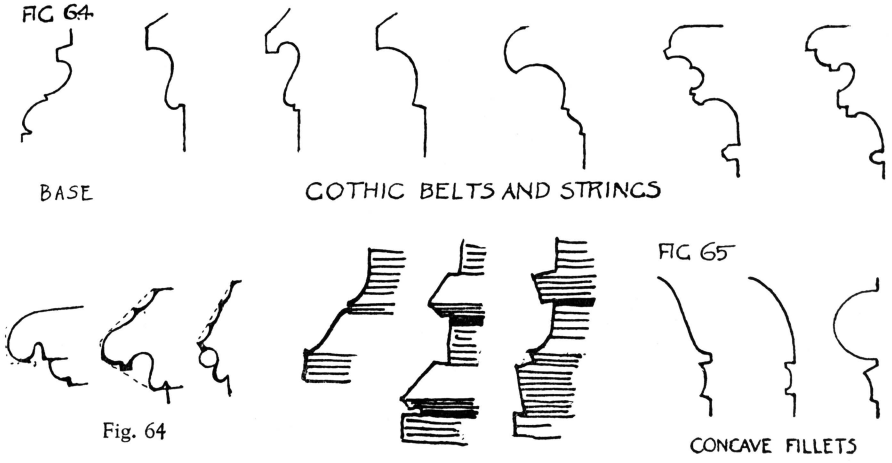


Fig. 64

Fig. 64

Rounding the corners of fillets softens the effect of the moulding, producing a high light at the upper corner, and a halftone at the lower. This usually gives the work a lack of virility which is to be avoided, although at times it is desirable in minor subjects to prevent dryness of character; for instance, in borders of plastic work, especially when the fillets are delicate.

Base moulds have frequently slightly rounded fillets. Concaving the face of a fillet makes its effect more brilliant (Fig. 65).

The beveled fillet is of no particular value, and is crude in appearance.

CHANNELS

Channels are the cut-in reverse of the fillet, and are not as valuable; tending to injure the integrity of the ashlar surface. They produce texture.

The V-cut channel is used to obtain a shadow line without disturbing a profile, and by repetition creates a tone. It is used at the base of the Greek Doric Echinus (Figs. 33 and 59).

Channels, like fillets, are, in nearly all cases, auxiliary. The definition of joints is increased by channels. Repetition of fillets or of channels are usually undesirable from their monotony.

MOULDINGS WITH CURVED PROFILES—SINGLE CURVES.

Single curves—The sections of mouldings having single curves are either parts of circles, of ellipses, or of parabolas or hyperbolas —(parabolas are conic sections made by planes cutting a cone parallel to its pitch). Hyperbolas by planes parallel to its vertical axis (Fig. 15).

The curves struck with a radius, i. e., parts of circles, are not as subtle as are the others, and seem commonplace in comparison.

Sections of Greek mouldings are seldom parts of circles, while those of Roman mouldings are usually parts of circles (Figs. 71-90).

CONVEX—SINGLE CURVE MOULDINGS.

BEAD

Convex single curves—The bead, large and small, is the simplest of curved mouldings, and is usually of semi-circular shape. It is known also as the Torus (rope or the half round: and half circle).

Being convex, it is sturdy and vigorous, and when large, it is often used as a strong base moulding, and when small for the same purpose as the fillet is used, and in association with the fillet.

A bead above the eye should usually have an auxiliary small fillet below it to prevent its lower edge in shadow from fusing into the wall tone. When below the eye, an upper fillet is often used. Both upper and lower fillets are frequently used.

The tones in beads, like those in cylinders, are graded from a strong, high light, to a dark shade and shadow, and change in a regular sequence. Beads of other sections than those of parts of circles, such as ellipses, parabolas and hyperbolas, give sublety to the general effect. Groups of beads give an effect of texture, but of nothing more. Half round, and ¾ beads are of value. The so-called Ovolo is of this type (Fig. 49).

By continuing the process of rounding the corners of a fillet, the bead is obtained.

The Bead gives an entire octave of tones in light and shade, and is a moulding of a higher type than the fillet, while serving the same purpose. Like all mouldings with a curved section, it does not gain in effect by repetition of itself. If used unsupported by a

fillet or other moulding, it is definite in the shadow at the junction with the background, and therefore requires defining at this point by an auxiliary channel or fillet. It is the most robust of all mouldings, and when vertical, has a columnar character which is nearly structural. If it is to hold its relative place amongst more complex mouldings, and not to overpower them, it must be reduced in scale.

Frequent repetition of beads is crude in effect, and to be avoided. *Mouldings must have contrast to possess fine character.* All convex surfaces express strength and power, but if used in excess are brutal in effect.

The sections of beads are of infinite variety, being parts of circles, ellipses, and hyperbolas, but it is not advisable to vary the axes of the curves of the sections greatly in the same piece of work. Beads occur more frequently in bases than they do in crown mouldings.

In Gothic work, and occasionally in Classic, the auxiliary fillet or channel below the bead is replaced by a deep undercut fulfilling the same purpose (Fig. 60).

Horizontal beads form excellent auxiliaries, especially as the bottom members of groups, but they are not good texture producers. Vertical beads suggest structural motives, and are governed by structural suggestions, and are therefore frequently grouped together as colonettes (Fig. 61).

Beads are varied in size in the same manner as are the fillets, and are used as groups of reeds or beads as borders.

CONCAVE—SINGLE CURVES.

CAVETTO

The hollow or Cavetto is the reverse of the quarter round, and with similar curves. When in excess of the quarter round, it is known as the Scotia (Dark). The bead produces about 1/6 shadow area at its lower portion, the Cavetto and Scotia ½ or more shadow at its upper portion, with the direction of the light at 45°.

As a result, mouldings in which beads are dominant, have strong lines of high light, and narrow lines of shadow, while those in which cavettos are dominant have broad lines of shadow and little high light.

Vertical planes are to be considered as less in tone value than a high light, but as they are parallel to the great surfaces of a building, they harmonize absolutely in tone with the surface, as other mouldings do not, and are therefore the first elements to be considered in grouped mouldings.

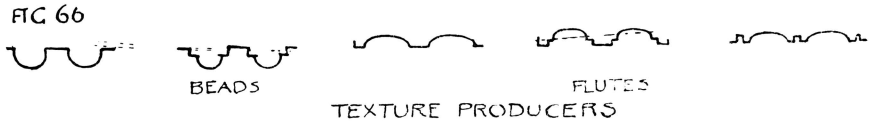
In mouldings which project beyond the ashlar face, it is inadvisable to cut the hollows back of that face, as sense of stability is thus jeopardized. There are rare exceptions in bases and base courses.

FLUTES

Flutes are grooves, and are the reverse of the convex beads or reeds, and like them produce texture tones and give apparent strength in the direction of the flute, but unlike the convex beads, are not commonplace and often give refinement.

Flutes meet in an angle or arris in the Greek Doric columns, but in other cases have small fillets between them.

Hollows, like beads, have auxiliary fillets at their borders (Fig. 66).



Half-hollows are constantly used at the change from one plane to a more advanced one, as at the top and bottom of the shafts of columns. They are then known as Congees (Departures).

SCOTIA

The reverse of the bead or torus is the hollow or flute or scotia (Fig. 53).

These serve as foils to adjacent beads, but are not good texture producers when used horizontally.

Vertical hollows or flutes suggest tendency or direction.

PROPORTIONS OF GROUPINGS.

In grouping beads and hollows, the hollows should exceed the beads in area, or the effect will be heavy and crude. Beads are best full, hollows shallow, when vertical. This does not apply to the

deep hollows and undercuts of the Gothic style, which are employed to produce strong separating shadows between groups of mouldings, and which are therefore individual in their treatment (Fig. 31).

Beads can be varied upon their surfaces (Fig. 67).

Hollows being in shadow, require but little if any variation of this kind unless they are of very large relative scale.

Interwoven or interpenetrated fillets or beads or hollows come properly under the head of ornament, and are subject to the laws of ornament.

Fillets and beads are more frequently auxiliaries than principals in Classic work.

Hollows have auxiliary fillets to define their boundaries, otherwise the transition from bead or hollow to background is too vague (Figs. 50 and 51).

Metal mouldings have fine arrises and fillets, exaggerated hollows and minimized beads, thus expressing greater strength and firmness of edge and flexibility of material (Fig. 34).

An overuse of fillets and beads produces wiriness and monotony. An overuse of hollows produces an effect of weakness.

CHAMFERS

Next in simplicity are Chamfers. These are produced by beveling corners, either by a plane or with a moulded surface.

Chamfers can be indeterminate in length, being stopped by contact with other forms, or they may have their own individual terminations, which are of many varieties, and of very considerable interest. The simplest form of chamfers is an elongated bevel. It can be varied by having a concave or a convex section, or the length of the chamfer can be sections with any moulding desired. The terminations are unlimited in variety, and in panel work are often grouped to make decorative foci (Fig. 29).

The simpler the chamfer, the larger is its relative scale to the corner it ornaments. Chamfers, therefore, must be smaller than

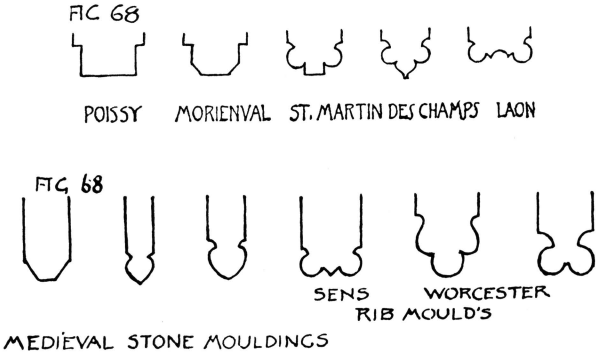
adjacent mouldings, or else complex in character. As they are manifestly occasioned by the desire to avoid the bruising of corners, they are better adapted to wood than to stone, the simplest and best method of guarding a stone corner being to round it. They are, however, common to both wood and stone, but are merely simulative in metal, and do not express the qualities of this material. Chamfered columns are not infrequent in Oriental work, while in both Oriental and Gothic, the chamfer terminations become highly ornamental, forming pendants and canopies (Fig. 29). In fact, the beautiful stalactite ceilings of the Moors are but the apotheosis of the Chamfer.

Short Chamfers, repeated and grouped, make very decorative borders, and finally become ornamental notches merely (Fig. 29). A very large proportion of the fine Venetian, Paduan and Viterbo decorated mouldings are elaborated notched chamfers.
The Chamfer is usually associated with simple and heavy wood work, for if the chamfer is of any size, the wood must be thick to take it.

An overuse of chamfers is therefore suggestive of heavy, crude work, lacking refinement, while perhaps possessing virility. Very flat chamfers are ineffective unless moulded at the ends.

CORNER ROLLS

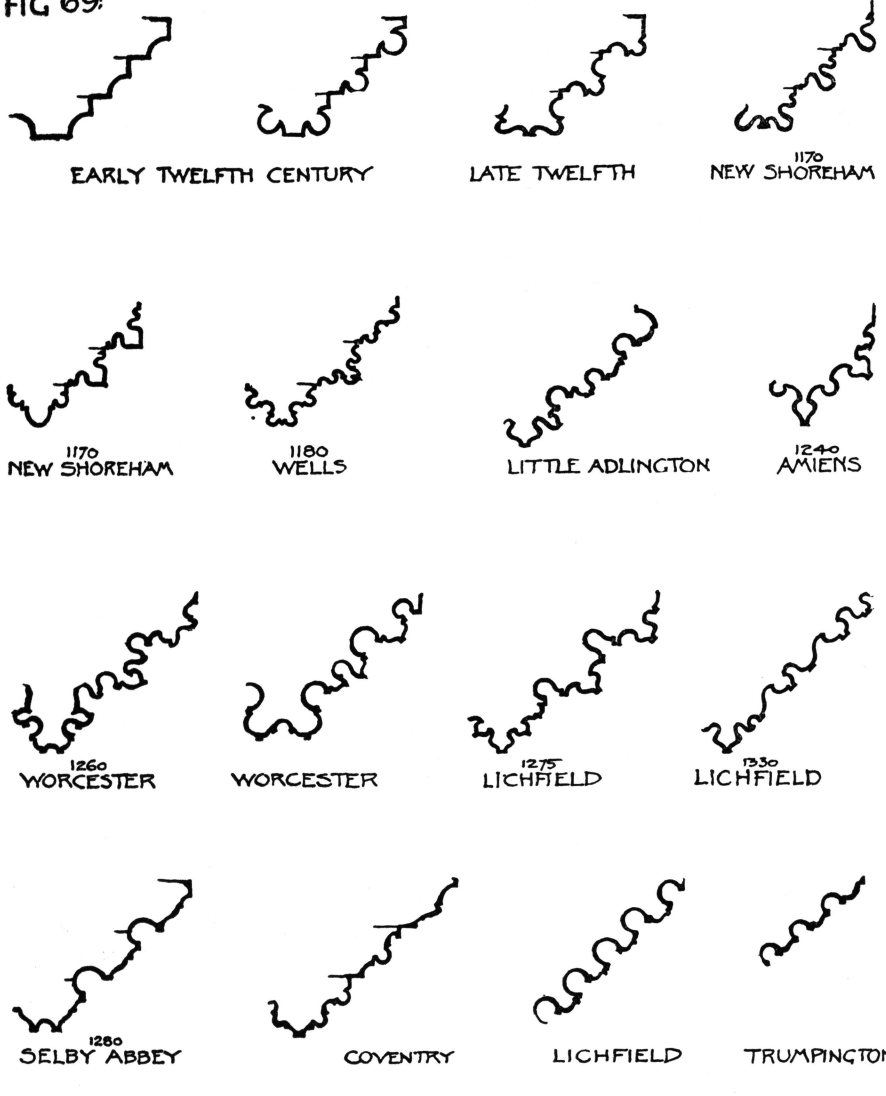
Next in importance to chamfers are the corner roll mouldings. These are essentially stone mouldings contained within the surfaces



of the stone, though frequent in metal, and have the same purpose as the chamfer, to avoid injury to corners (Fig. 68).

PIER AND ARCH MOULDINGS
GOTHIC

FIG 69.



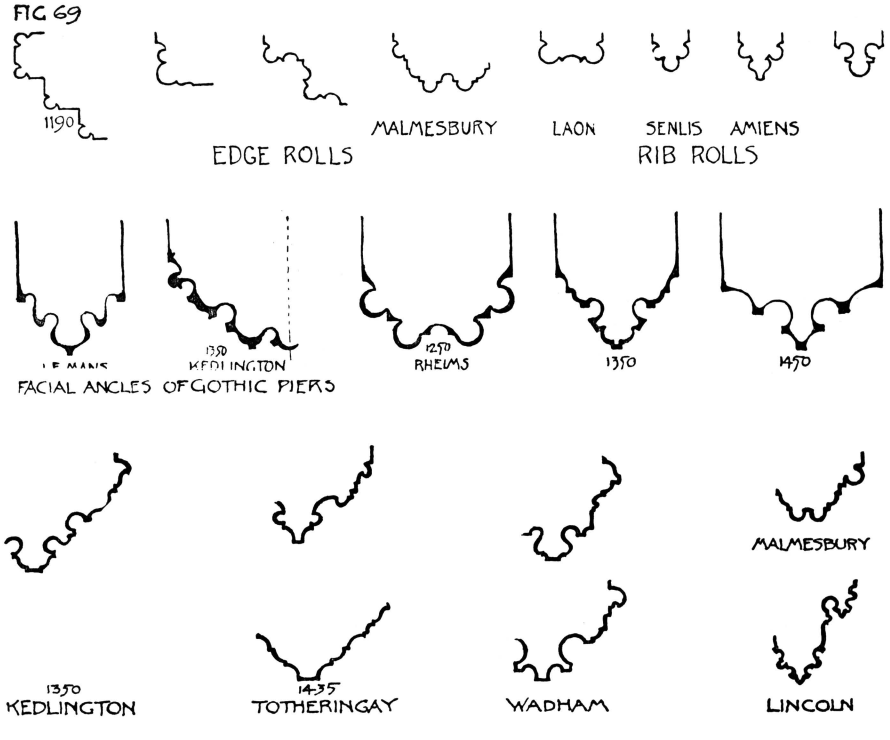
These corner Rolls, when used as vertical mouldings, have a columnar effect, and in many cases are practically grouped columns. They appear in early round arched work, and after many developments and changes, produce the complicated and beautiful sections of the Gothic door jambs and architectural mouldings (Fig. 69).

Grouped and varied in size, they are very vigorous, with fine light and shade. They require contrasting hollows, from which they are often separated by subordinate fillets or channels.

As their section is seldom shown, they are to be studied for the composition of light and shade in the groups, not particularly as individual mouldings, excepting in regard to relative scale.

The reverse of the Roll, i. e., the Cavetto or Scotia, is usually a foil to the convex mouldings, or to plane surfaces or fillets.

It produces strong, effective and graded shadows, and as the major part of its surface is always in shadow, its section is seldom elaborated, which is not the case with the roll (Fig. 69).



MOULDINGS OF COMPOUND CURVES.

These mouldings are necessarily compounded of convex and concave curves. Of these the so-called Cymas (derivation, Greek, wave), are combinations of quarter rounds, ovolos and cavettos.

CYMAS

When the Cavetto is at the top of the moulding, the moulding is called a Cyma Recta. When it is at the bottom, a Cyma Reversa. When the curves are in excess of the quarter section of a circle, the resultant mouldings are known as Ogees.

When the sections are parts of ellipses, parabolas and hyperbolas, the mouldings have much more sublety and distinction than when they are of parts of circles (Figs. 15-4).

Of the compound curves, the Cymas are the finest, and are of great variety, partaking of robust or of delicate character in proportion as the convex or concave curves predominate (Fig. 8).

Cymas especially require small fillets to isolate and define them from the adjacent surfaces.

They form better upper and lower mouldings in a group than they do intermediate units (Fig. 8). Cyma rectas of great convexity in the lower portion of the curves are indicative of Oriental origin (Fig. 10).

Cymas are so frequently used as the top mouldings of cornices, that these mouldings are known as Cymatiums.

The Cymas are used in conjunction with other mouldings both as top edge mouldings and as supporting members, combined below a retreating quarter round or an ovolo, the cyma recta creates a beak moulding. Combined below a retreating reversed Cyma, it forms the lamb tongue moulding (Fig. 58).

In Gothic sections the roundels become pointed, and in the 13th century became lamb's tongue mouldings, composed of ovolos with fillets between, and later of cymas or of Ogees with fillets between (Fig. 69).

Horizontal Gothic mouldings had their top surfaces beveled, and deep undercut hollows instead of soffite and bedmould.

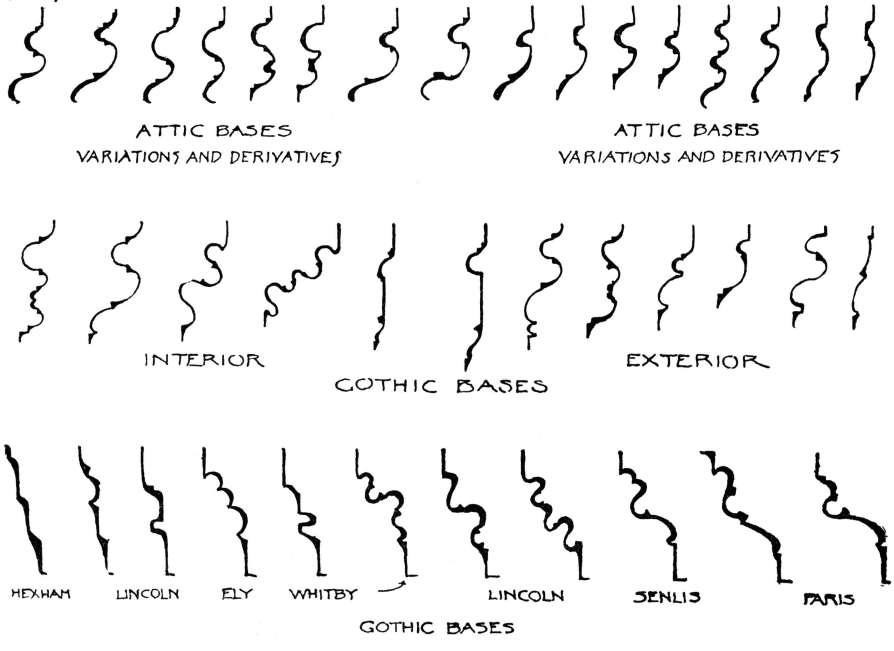
These hollows become characteristic both upon both exteriors and interiors, and are upon the capitals.

The result is that, in Gothic interiors, the mouldings frequently have characteristics borrowed from exterior necessities, which are superfluous.

The projections of string courses, etc., in front of Ashlar surfaces in Gothic is not due, as in Classic work, to applied mouldings, but to the overhang of cap-stones at the top of integral parts of the stone structure, to shed water away from the wall surface (Fig. 64).

As classic work antedates other styles it is natural that its forms should be echoed at times in later but very different styles; and as medieval work antedated Renaissance styles, it is usually equally natural that some of its forms will be found in Renaissance work. Transitional periods afford the more frequent mixture of styles.

FIG 70



Mouldings of reversed curves, or with leaf-shaped sections such as the bird's beak moulding, are very brilliant in effect, but to be used sparingly. When these mouldings have their curves separated slightly from each other by fillets, they at once have a Gothic character.

TRADITIONAL COMBINATIONS.

In the evolution of mouldings, there are several grouped mouldings which appear persistently in the same relation to each other. They seem to have been a survival of the fittest combination of forms. Of these, the scotia between two rolls or tori is the most frequently found.

ATTIC BASE

This group forms the attic base (Fig. 70), which is the root form for far the largest number of moulded bases in existence; and it is constant in recurrence throughout Gothic work, in jambs, and ribs and string-courses. It has the elements of strong contrast, which make it a very vigorous moulding.

Its reverse, the roll between two hollows, is most frequently to be found in Gothic work.

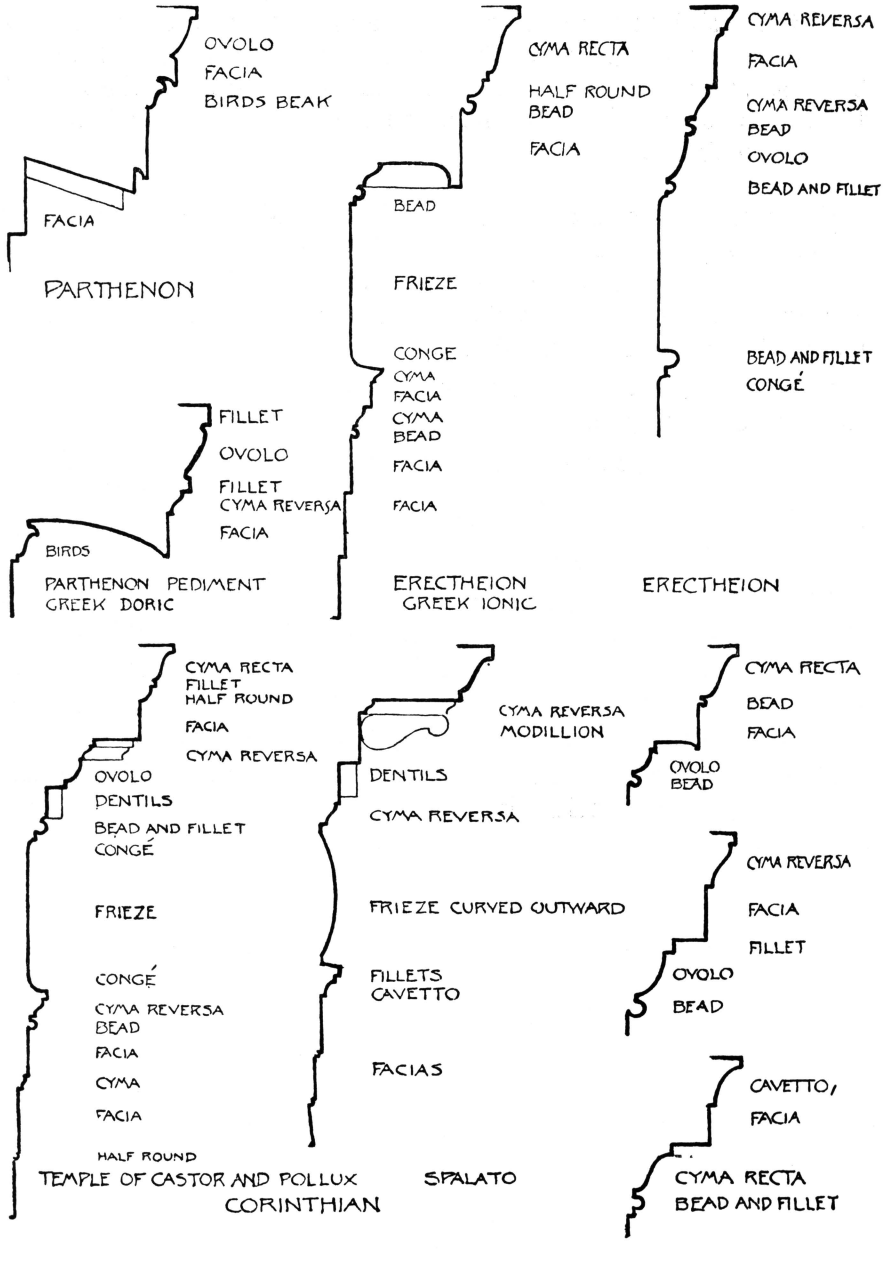
The second in point of frequency or recurrence is the combination of cyma recta and cyma reversa. With the separating fillet introduced, it is almost the universal crown moulding of Renaissance entablatures of whatever order (Fig. 71).

Of secondary importance are the Cymas or Cavettos with the bead. These are found as the outside mouldings of architraves, as panel moulds, at the top of the epistyle, and at either edge of the bedmould in classic work. The double ogee is very frequently used in Oriental work, and also in decadent forms of any style.

It seems to indicate lack of skill, and of knowledge of a highly developed system of mouldings.

FIG 71

COMBINATIONS FREQUENTLY ADOPTED



CHAPTER VIII.

GROUPED MOULDINGS.

Grouped mouldings depend upon variations of the size and character of their factors and their shadows for their interest, and many groups are made of combinations of fillets, beads and hollows alone, without the use of mouldings with a compound curve. If these groups are made up of mouldings of identical size and shapes, the effect is obviously one of monotony. Contrasts give interest.

In any arrangement of units, one of the following method of order is adopted:

1. Identical units at equal intervals.
2. Identical units at alternate intervals.
3. Identical units at intervals of ratio.
4. Alternate units at equal intervals.
5. Alternate units at alternate intervals.
6. Alternate units at intervals of ratio.
7. Various units at equal intervals.
8. Various units at alternate intervals.
9. Various units at intervals of ratio.

The variations in units are those of size and shape. There can also be alternates of ratios, ratios of alternates, ratios of ratios, and combinations of all.

The combinations are infinite, but should in every case have order, or the result is confusion, and it is desirable in each case of combination to have a dominant method expressed, of either convex or concave types.

Alternation of convex and concave sections is very frequently used in profiles.

The Attic base is an example of alternate shapes with the convex forms dominant (Fig. 70).

Gothic pier sections progress chronologically from dominant convex forms to dominant concave forms. The Egyptian bell cap is an example of alternates with the concave curve dominant (Fig. 17).

METAL MOULDINGS.

Metal mouldings develop delicate flattened curves, the mouldings having greater projection than widths (Fig. 34).

As metal is heavy, and the objects made of it comparatively small, it is customary to minimize the quantity of the material.

The first use of metal was in laminae, and in thin sheets, and when it is thus used, and from the elimination of superfluous material it naturally takes concave forms more frequently than it does convex forms.

When stone or even wood forms are imitated in it, as is often the case in cast work, it loses its individuality. The same is true of glass.

Metal work is at first that of repoussé sheets; and whatever mouldings are used in connection with these are made by small rolls and fillets of the metal, introduced for the purpose of stiffening the work.

When cast work makes its appearance, the mouldings are small imitations of those already adopted upon architectural forms.

Spun metal work, such as the large discs, with their edges turned downward, and decorated with leaf forms, which were placed upon a central shaft, is to be found among the Etruscans.

From these discs developed the profiles of Florentine Lamps, and of the long metal bars in grill work, with mouldings which seem like discs strung upon a rod (Fig. 34). The mouldings of terra-cotta resemble those of the stone, excepting that they are not as robust, or of as great projection.

TURNED FORMS.

PROFILES

The profiles of the Greek vases are very subtle and beautiful, whether of slight or full curves, and are, in every case, the outcome of the exact form best adapted for the purpose intended, refined by careful study.

The religion and ethics of the Greeks tended, after the first centuries of their existence, to make them conservative in the expression of their arts. Work in all branches of art was devoted to refining and beautifying forms which had already become conventions (Fig. 25).

The vases, especially those of the amphora type, suggested, apparently, the balusters of the Renaissance. They have but few mouldings, liprolls, or fillets being the most frequently used. *There is always some body-curve which is dominant;* and as these curves are seldom parts of circles, but usually as with the mouldings, hyperbolas or parabolas, there is no monotony in the profile.

Turned forms as units of architecture or of decoration, can be traced back to the reeds of Egyptian construction, and are developed both from this source and from the vases turned on the potter's wheel. It is probable that there may have been wood turning as a craft among the Greeks, but the results are not extant.

Classic compound mouldings are seldom of Ogee sections, while on the contrary, Gothic and Oriental mouldings are of pronounced S type, especially when used as undercut drip mouldings. Top surfaces of medieval drip mouldings are not only beveled, but often curved, forming exaggerated beak moulding sections (Fig. 73).

The more refined and delicate the work, the flatter the curves in the mouldings, and the fewer they are in number, and the less complex they are in combinations. *Dominance of concave sections produces delicacy of effect.*

DOMINANCE

Dominance of convex sections produces vigor of effect, and all gradations of expression can be obtained by combinations of both.

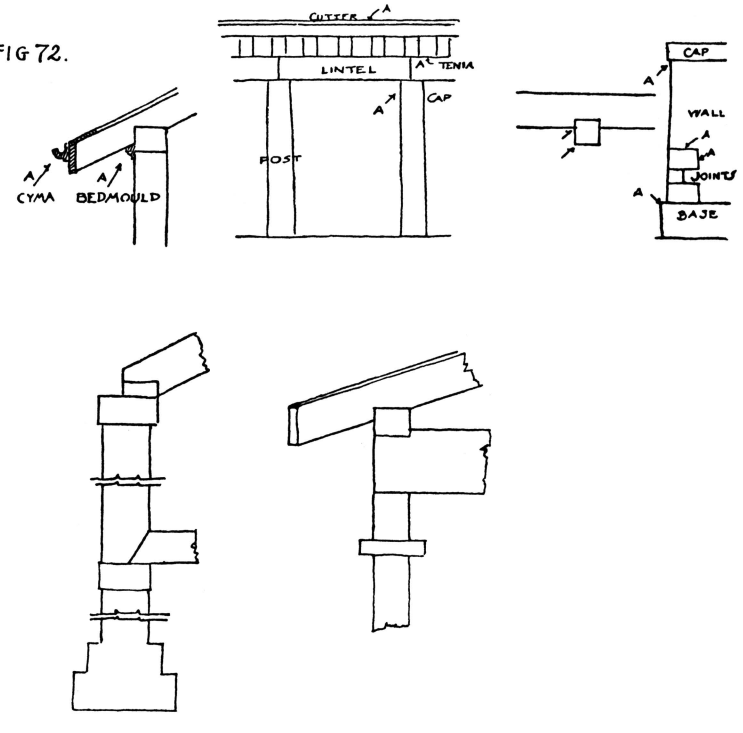
A preponderance of compound mouldings is confusing in effect. The main factors of structure should be treated with simple mouldings, complexity of sections being confined to secondary intimate developments.

CHAPTER IX.

POSITION OF MOULDINGS.

A building is, or should be, an organic whole, and has its integral parts an analogous resemblance to the most perfect types of nature's organisms, the higher animals, i. e., it has a base or foot, a body or mass, and a head or crown; these are the main horizontal divisions (Fig. 72).

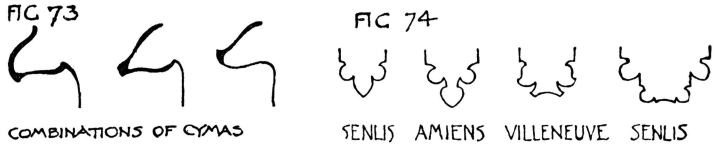
FIG 72.

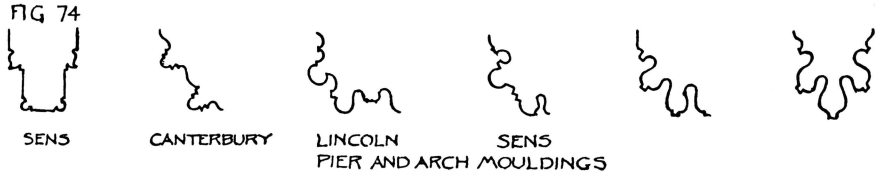


The divisions are, in the majority of cases, influenced only by the sense of stability and equilibrium; i. e., they are so arranged that they conform to the law of gravitation, and never violate it.

It will be found that the mouldings which subdivide the design into the horizontal parts are more subject to diverse influences than are the vertical mouldings, and that the latter are capable of freer and more eccentric treatment.

It is also evident that the horizontal mouldings can be, and often are, used upon diagonal or sloping planes, and also as vertical mouldings; while the vertical mouldings do not as well lend themselves to horizontal treatment.





As mouldings, in most cases, give testimony of their structural antecedents, horizontal mouldings retain structural indication of derivation more than do vertical ones, which become, in many cases, purely ornamental, and are designed solely for effects of light and shade.

INFLUENCE OF POSITION UPON HORIZONTAL MOULDINGS.

POSITION

To establish a sense of security and permanency, lower mouldings should be as units in larger scale than upper ones: i. e., the distance apart of the dominant mouldings of each group should diminish as the design ascends. On the other hand, upon buildings, as distance diminishes in order to be clearly intelligible, while the secondary mouldings of the lower groups near the eye will permit very considerable secondary subdivision and intricacy, the dominant moulding in each group should be well defined, and the dominants should harmonize in character, especially if near together.

BASE.

BASES

The base is the foot of the structure, or of some of its relative parts. It is manifest therefore, that it should not retreat behind the main plane of the body above, excepting in small objects such as urns, vases, etc., which have a low centre of gravity, and are poised (Fig. 25).

The lower moulding of the base is usually the dominant, expressing stability. The chief apparent exceptions are in certain Ionic bases, where the principal torus is in the upper part of the base (Fig. 90).

Square plinth blocks to circular bases should not be judged by their actual profile, but by the profile of a section cut upon the mitre or diagonal. They have therefore, occasionally, when used in connection with bases circular in plan, less projection than the circular bases, or are made octagonal in plan.

Circular bases should be judged not by their sections, which are only evident from a point in the same horizontal plane, but by the effect of the outlines of the respective superposed discs upon each other. For this reason, bases below the eye have the upper members decreased in projection, and permit the lower members to be seen, while those above the eye have the projection of the lower members relatively decreased.

In the most effective bases, the upper and lower members project, while the intermediate ones retreat, but not behind the face of the shaft which the base supports.

The upper member usually projects with either a pitched upper surface or a rounded one, and with or without a subsidiary fillet. The lower member, which is usually the principal one, has a projecting torus or cyma reversa, with fillets. If the cyma is used, the base fillet needs to be broad. The intermediate members are usually cavettos or scotias, with the sharpest curve at the top, with or without fillets.

In all cases where bases are below the eye, bottom fillets on projecting mouldings can be omitted; where above the eye, top fillets can be omitted.

Bases above the eye are heightened to counteract perspective.

WALL.

The wall either exists as a surface without openings, or with doors, windows, or recesses, such as niches, etc. It is primarily entirely utilitarian, and in its crudest form is built of any and all materials at hand. As a surface it has the quality of texture and of color. The first indications of possibility or surface treatment or walls are occasioned by the natural lines or joints between the units of its constructive material (Fig. 24).

WITHES

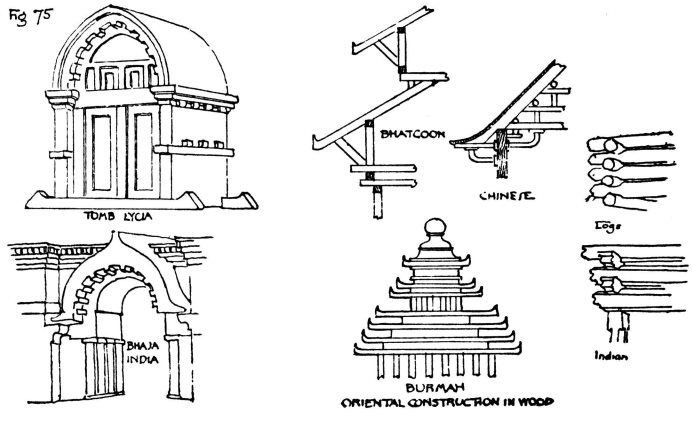
The first walls or fences are of interwoven withes, plastered with mud, or as in Egypt of sheaves of reeds bound together. The method of constructing this fence conforms, as does all primitive construction, to the demands of the law of gravitation; i. e., the withes or reeds are either laid horizontally, or they are stacked vertically (Fig. 21). The horizontal method gave the suggestion of horizontal parallel striations to wall surfaces, while the perpendicular reeds suggested vertical treatment and convex-fluted shafts.

Neither suggestion, as far as treatment of wall surface was concerned, was persistent or produced a moulded system for walls, for they were soon built of more lasting materials, and wall texture and treatment partook of the character of these materials.

LOGS.

LOGS

There was, however, a wood construction of walls which influenced the architecture of the East especially in India (Fig. 31): i. e., the method of building with logs.



Log cabin construction is the antecedent of the stratified stone construction of many of the Indian temples, and has left its trace not only in the marked horizontal forms, but in projectings which correspond with the ends of the logs at the outer angles, in the broad splaying or chamfering of corners, and in the general character of the mouldings (Fig. 75).

Overlapping boarding or sheathing in wood construction was coincident with the progression of tools and a knowledge of their use, and by this time brick and stone wall construction was also in use, and the time had passed for the sheathed wood forms to develop embryonic stone forms.

PANELLING

Panelling in wood was deliberately imitated in stone at a very early period, and this imitation has been persistent in all styles. Interwoven withes suggested interlace wall surface patterns, and occasionally these had slightly moulded surfaces and angles, but require no special mention as mouldings.

JOINTS.

With the introduction of brick building a new element is introduced into wall texture. Whatever the size of the brick the joints are evident, and the horizontal joints are most continuous and more conspicuous than are the vertical ones. The consequent horizontal striations were still further accented, both by bonding courses of brick headers, and by bonding courses of stone inserted to strengthen the wall. Walls with horizontal bands were a natural result, the bands either recessed or projecting, forming crude mouldings which, when their angles were chamfered or rounded, became beaded and moulded string courses (Fig. 24).

JOINTS

When cut stone appeared in wall surfaces the joints of the stones of the wall were at first made as inconspicuous as possible; but the desire for ornament led to the introduction of mouldings at these joints, and the angles of the stones were chamfered, rounded and moulded in every variety of form. In spite of this, however, wall

treatment should be related to the treatment of the foot or base, and to entablature or crown. Scale of texture is obtained by joint treatment of courses of material.

OPENINGS

Apart from the wall itself, the treatment of minor openings through the wall requires attention. The mouldings around these are in the nature of frames of light and shade, and vary from simple border lines to the most fantastic forms. In many cases they echo in miniature the qualities of the larger masses about them. It is in their relative scale to the large motives of the structure that these framing motives about openings need to be particularly studied, for they must either be in just scale with the larger parts, or else of so much smaller scale that they no longer appear constructive but merely decorative. Like all frames or borders, they should be strongest on their outside lines, not inside next the openings.

When openings are subdivided, either by colonnades, arcades, mullions, transoms or traceries, *the outside framing mouldings should either be stronger than all others contained within them, or omitted altogether; for a plain wall surface is much stronger and more vigorous than an inferior and weak moulding.* All frames are trims.

PIER.

PIER

The wall, when large openings are required through it, thickens and contracts into the pier. In the classic, the columns, shaft or circular pier has its antecedents either in the wood post or the sheaf of reeds, and the column is thoroughly evolved in wood and stucco before cut stone construction becomes prevalent, and the columns once established, it is used preferably to the square pier.

In Gothic work, on the other hand, the sequence is different, for while there are many circular columns which have descended from the earlier classic forms, there is a constructive development or pier treatment from which springs the elaborate grouped piers, colonettes and shaft mouldings of the Gothic styles. The sequence of this development is entirely structural, and belongs essentially to stone construction, and is not imitated from that of any other material. In the early Gothic work these forms are entirely structural,

but in the later they often become moulded surfaces of solely ornamental character.

SEQUENCE

In a few words, the sequence of development of mouldings upon the pier is as follows: The square or rectangular pier has its corners chamfered, rounded or beaded to minimize chance of injury, and these chamfers and beads, after the interposition of the capital, follow the arch and become the genesis of the arch mouldings.

When transverse arches appear the pier takes the form of a cross in plan, and a set of transverse arch mouldings is developed; and pier.

The later Gothic pier mouldings therefore, are groups of individual mouldings, each of which as it ascends and reaches its place of structural duty separates itself and departs from the parent stem; and as these duties are of various kinds and of different degrees of importance, the profiles of the congregated mouldings as they diverge from the pier are of the greatest possible variety (Fig. 74).

The study of these mouldings is therefore the study of Gothic architecture, and no attempt should be made to design Gothic profiles, except of the simplest description, without a thorough knowledge of the growth and development of Gothic architectural construction. The same organic growth is as constant in the mouldings of traceries as in those of piers.

SHAFT.

SHAFT

As before mentioned, the classic column is derived from the wood post or from the sheaf of reeds. In either case there was no reason for its spreading at the foot, as it was a mess of vertical fibres, which by spreading would become weakened. There is every reason, however, why these fibres should be held together at each end, and it is therefore to be expected that encircling bands will appear in the Egyptian columns, and are echoed by the annulets below the cap of the Greek Doric. No important base appears or is to be expected, that of the Egyptian shaft being a circular disc, apparently for the purpose of obtaining a level bed upon which to place the shaft. The Greek Doric has no base. The entasis of the early columns would be suggested by the natural diminution of the tree-trunk or of the reeds as they ascend.

SHAFT

The vertical fluting of the shaft may have been suggested either by the reeds themselves, in which case the flutes would be convex as in Egypt, or by the attempt to make the post evenly round in section by planing, in which case they would be a series of plane or convex surfaces, as in Greece or at Beni Hassan.

FLUTES

The number of the flutes seems to support this inference, the tree being first planed upon four sides, then made into a rough octagon, and finally the corners of the octagon planed, making sixteen flutes. The depth of flutes should not jeopardize the apparent strength of the column. Flutes winding about the column, forming so-called twisted columns, should be used only on small forms which carry little weight. They are much more applicable to metal and to wood than to stone. The later stone bases upon the other hand, are developed from the wall foot. The wall of brick or stone spreads at its foot to obtain greater security, and to distribute weight upon a larger bearing surface. In doing this there exists a broad footing course, and if the materials are small in size, successive supplementary courses occur retreating to the wall-face, these upper footing courses are chamfered to shed water, or to avoid broken corners. When the wall contracts into the pier the main footing course is maintained as the plinth block; the auxiliary courses, chamfered or moulded, become the base to the shaft. The plinth in most cases remains square or plain, the remaining courses being merely auxiliary take the plan of the columns. These shaft bases never need be important, and should be equal or subordinate in height to all similar or corresponding wall base courses.

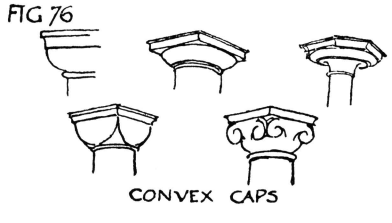
CAPITAL.

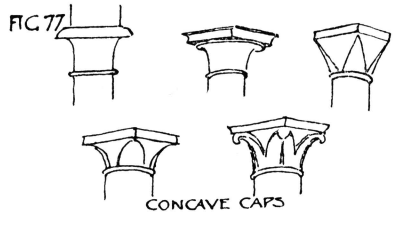
CAPITAL

This is in all architectural styles the point of greatest organic changes, i. e., it marks termination of the vertical support or shaft, and the beginning of horizontal support of beam or lintel, or of arch support. *It is therefore a point of marked accent, and becomes, therefore, the most richly decorated of all architectural units. Its proportions in relation to forms both above and below it cannot be too carefully studied, and while deservedly ennobled with wealth of design, it must never lose its structural vigor.*

The forms of capitals are derived from various sources. Those that are developed from the termination of wood or reed shafts have a square block at the top, the abacus, which was evidently inserted to insure even bearing of the lintel (Fig. 17).

The top of the shaft below this block spreads either with a convex line, as in the Greek Doric, or as a bell, as in the Egyptian bell cap (Fig. 17). The convex cap has been called the cushion cap. Its support is strong, vigorous and adequate, and it therefore requires slight accent from decoration. The bell cap, on the other hand, while graceful and exquisite in line, suggests the yielding of the material from which it was derived, i. e., the crown of the reed shaft curving under superincumbent weight. Especially is this the case where the corners of the square abacus project beyond the perimeter of the bell, and it is here that corner scrolls are thrown out to give apparent support to these corners.





But in all cases, whether the cap be convex or concave the integrity of the main form should be preserved and manifest, and ornament is best, merely incised within it, or outside of the cushion or of the bell.

DORIC CAP

The Doric cap is convex. The scrolls of the Ionic cap are unique in character and of somewhat uncertain derivation but are adjuncts to a convex cap. The Corinthian and following classic variations are bell caps.

The classic orders of architecture, once established, naturally influenced all succeeding styles. Therefore capitals derived from these orders are very widely distributed. But there are, in addition to these, capitals which are developed from stone construction pure and simple and those which are merely fragments of wall, crowns or cornices.

STONE CAPITALS

Capitals derived from stone construction are first of crude form, being stone blocks at the top of shafts, round at the shaft and square at the top and often spreading very much to carry breadth of wall and arch mouldings.

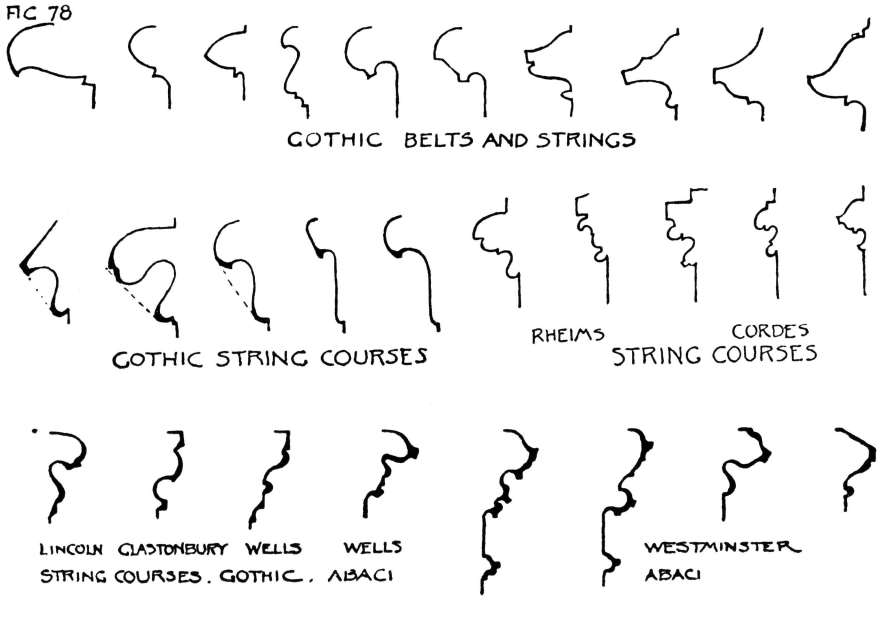
Their variety is obtained by the many methods of getting from the round to the square, either by chamfers, facets, or mouldings. Many Mohammedan capitals are of this description, and many have corner pendants in the place of the Corinthian scrolls (Fig. 77). The respective mouldings of wall string courses and of capitals react upon each other in stone architecture.

In some cases the string courses are suggested by the caps; in more cases the caps are merely portions of string courses carried around the tops of the shafts, often the string course forms the abacus only.

As pure architectural styles become debased, capitals were formed from fragments of entablatures, form superposed above form, and the capitals were given a very disproportionate size to the height or size of the shaft.

In Gothic work, the string courses were often continued by the cap abacus mouldings.

FIG 78



ASTRAGAL

The joint or division between cap and shaft is marked in most cases by an auxiliary moulding, usually a bead, called the astragal. This moulding should never be large, for in that case it prevents the cap from appearing to be an integral part of the shaft. All study of capitals comes properly under the head of architectural ornament, and in the best capitals (excepting the Doric) cap mouldings are subordinated to the ornament.

Abacus mouldings should be simple, so as not to destroy the apparent strength of that member.

Vertical mouldings in capitals are of little value as their lines are distorted, both by the circular form of the cap and by the shadow of the abacus.

ENTABLATURE.

This is the crowning feature of the wall and is derived from structural motives, in many ways, and from many materials. It is influenced by materials, by climate, by purposes of construction, by position upon the building. Its various forms can be classified as follows:

EAVES

First—Cornices of wood. These are in the nature of eaves to protect the wall below from the action of rain. They consist either of projecting beams or of rafters which carry an eaves moulding or gutter and the roof covering beyond the face of the wall below. The projection varies in proportion to the protection desired for the wall, and is usually greatest in countries where heavy rains occur. The pitch or angle of the rafters varies, and is usually greatest where snows occur. The eaves mouldings is most important in these cornices, the second moulding of importance being at the top of the wall below the beams, forming a bed for these beams. It therefore receives the name bedmould. From this construction came the suggestion of most oriental cornices.

Second—Entablatures of wood over peristyles, porticos or colonnades. These consist of lintels on top or shafts at the same level as the plate at the top of the wall within the peristyle; cross beams from the plate to the lintel at regular intervals, and always over the centres of the shafts; secondary plates above these cross beams, and over the lintels, and finally the projecting rafters. The

minor parts are a board or facia protecting the ends of the rafters, the gutter moulding, and the bedmould. From this primitive construction came the suggestion of the classic entablature (Fig. 38).

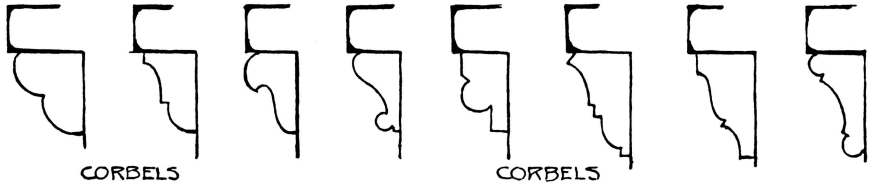
Third—Cornices suggested by reed and mud construction. This class developed from walls of vertical reeds, bound near, but necessarily below, the upper ends of the reeds, the top of the wall covered with mud or clay, and consequently pressing the ends of the reeds out and over the face of the wall, affording it protection. From this construction came the suggestion of the concave cornice of the Egyptians (Fig. 17).

Fourth—Cornices of brick or of stone, evolved entirely from wall construction. The walls themselves were capped with the most solid material available, and the cap course projected beyond the face of the wall to protect it from the weather. The more this capping course projected the greater support it needed, and supplementary under courses were thrown out from the wall to afford it support. This cap course also required width, but as little height as possible; it therefore became comparatively thin in proportion to the supporting auxiliary courses. These in their turn had their lower edges chamfered or cut away with mouldings, so as to eliminate all necessary leverage of weight at the outer edge. The character of these moulded courses varied with local skill in cutting stone or moulding brick, and the scale depended entirely upon the units of construction, i. e., whether of large stones or of small bricks. From this construction came the suggestion for the so-called Romanesque cornices.

CORNICES
MILITARY

Fifth—Fortification cornices of wood, brick or stone. These projected far beyond the face of the wall, being practically overhanging galleries in the floors of which were openings which commanded the base of the wall below. The great projection could not be carried on continuous bedmould courses, for these would not allow the above mentioned openings, and were therefore carried on moulded brackets or corbels of great strength, as they were required to support on their outermost projection parapet walls to the galleries, which necessarily exerted great leverage (Fig. 79).

FIG 79



The parapet walls were pierced with openings, at first narrow slits, but later enlarged and producing the crenallated and machicolated wall crests so frequent in mediaeval architecture. From this construction came the suggestion of the brick and stone cornices of mediaeval Italy and the cresting and parapets of much of the Gothic work, and of the time of Francis I in France. Parapets of this character also appear in Assyrian work at an early date.

PROPORTIONS

All the cornices or entablatures excepting those of the second type, i. e., that over columns, which contained more constructive factors than the others, are small in height in comparison to the walls which they crown, and have evolved no established relative proportions, but can be used freely. Those of recognized proportions, which can be simply stated as follows. The columns in proportion to their diameters at the base, range from seven diameters to twelve diameters in height, as the style is sturdy or delicate, while the entablatures range from two diameters to one and one-half diameters or less in height.

Entablatures over pilasters with more wall surface than opening below the entablature are in many cases higher than those above detached columns. The same is true of those above arches, although in a less degree. The minor factors of entablatures will be noted under the different styles.

It is to be noted that only those entablatures or cornices which show the influence of the classic orders are subject to classical proportions, and that those proportions are based upon the accumu-

lated study of many generations of masters in the style, and that it is as inadvisable to violate these proportions wilfully and without strong cause as to violate the law of gravitation. Classic proportions in wood or in metal can become more slender and delicate than in stone, perforce of the qualities of these materials in regard to their individual characteristics.

CHAPTER X.

DERIVATION OF THE ORDERS (Fig. 38).

The classic orders of architecture were developed by the Greeks, and their very names, Doric, Ionic, Corinthian, testify to their derivation and to the people under whom they were perfected.

MATERIALS

As no developed type can exist without earlier embryonic forms from which it has sprung, it is certain that the established forms of Grecian architecture can be traced back to simple constructional elements. In doing this, however, it is well to recognize that by the eighth or ninth century B. C., at which time the Doric order takes definite form, the use of materials was well understood, both as to stone, clay, wood, stucco, brick and metal; and that successive improvements in construction had so far disguised the methods of primitive man at each stage of progress that there is a great variety of suggestions, of cross references, so to speak, in the traditional forms. So that while it may be assumed that the shaft and lintel, the pediment and mutule and triglyph are the distinct progeny of a simple wooden construction, there are also many factors which are the offspring of brick and clay walls, of metal plates, and finally of stone-cutting pure and simple; while the carved decoration of mouldings is merely a glyptic expression of previous polychromatic color.

REEDED COLUMN

The Egyptian column was convex fluted, suggesting the original sheaf of reeds which was used as a support. Long before the appearance of Greece among nations, this fluting had become refined in Egypt, and had later appeared upon the columns at Persepolis, with concave flutes and sharp arrises. The common adoption among eastern nations of stucco made of the so-called white Egyptian earth, as a covering for wood, brick and stone, in order to obtain a fine surface for color, made it possible for fine forms to be obtained readily.

The Doric echinus resembles a truncated Egyptian bud cap. With the exception of the flutes and echini the Greek Doric is almost entirely the apotheosis in stone of a simple cell with mud walls with peristyle of wooden columns carrying a lintel, which in its turn supported one end of the ceiling beams to the peristyle, the other end of these being supported on the wall. On top of these ceiling beams was laid a plate which carried the rafters, the ends of which projected beyond the faces of the plate and lintel, and of the walls where there was no peristyle, to carry away from the building the water from the roof. The rafter soffits and ends are developed into mutules, the ends of the ceiling beams become the triglyphs; the open spaces between (the metopes) are filled with boards, and of course, in stone with a slab of stone. There is a board pinned on the rafter ends which forms the facia of the cornice, while at its upper edge is a drip strip or moulding, and we have at once all the existing factors of the classic Doric order as follows (Fig. 38-A):

COLUMN—Composed of fluted shafts, no bars, a cushion or echinus cap with flat covering board or stone at top to equalize bearings, called the abacus.

1—LINTEL or EPISTYLE, simple, and often undecorated except by trophies, derived from beams on posts.

2—FRIEZE—The space between the top of the lintel and the bottom of the plate. At first this is, in wood construction, made up of the ends of the ceiling beams, with openings between; later the openings are filled; then the ends of triglyphs disappear; finally the frieze is one surface, but is more or less decorated.

The span of the lintel from post to post is about the same as the span of the peristyle ceiling beam; consequently the timbers are of the same bulk, and the epistyle and frieze are of about the same height.

The triglyphs are higher than they are wide, as would be the case with timbers carrying weight where grouped.

3—CORNICE—Above the frieze is the cornice, evolved from the plate, which becomes the bedmould, the roof rafters, which become the mutules, the facia, and the drip strip or gutter which becomes the cymatium. The plate spans only half as much space as does the

lintel; it is half as high or less. The rafters are light, but placed close together, and the structure grows lighter in construction but more numerous in parts as it ascends, as do all forms of very stable equilibrium. There are twice as many mutules as triglyphs, and twice as many triglyphs as columns.

POSITION

Now notice the position of the mouldings. They are at the points where one constructive form ends and another begins, at the articulations of the structure. Where the shaft ends is the capital, with abacus, echinus and channels. At the top of the epistyle or lintel is a flat fillet, evidently originally a protecting strip of wood. At the top of the plate is a bird's beak moulding, which with the facia of the plate later develops into complex bedmoulds. At the top of the facia of the corona is a cyma, later becoming the cymatium, evidently a drip moulding or gutter moulding.

The more important the organic change of constructive factors, or of change of plans in the design, the more complex are the groups of mouldings.

When the shaft with its vertical thrust ends and the horizontal load of the epistyle is felt, there is the richly moulded capital; and in the entablature, itself a mass of mouldings, the more important the change the more important is the group. There is little difference of surface between frieze and epistyle, and the mouldings at this point are slight; but as the cornice advances, the bedmould is enriched.

QUALITY

The Greek mouldings are the most subtle in line and shadow, the most finely cut and the most carefully studied of any in existence (Figs. 71-90). There is very great precision even in the smallest details; surfaces are most exact, curves most accurate, arrises and corners most delicate. The researches of Penrose and Pennethorne have proved that the Greeks used the curves of the conic sections, hyperbolas and parabolas and ellipses preferably to arcs of circles; and in cases where there is a certain heaviness of profiles, as in some of the work in granite or trachite, it must be remembered that the existing profiles were covered often with a fine stucco, in which any inequality was corrected and finer factors inserted.

VISUAL CORRECTION

Pennethorne asserts that the Greek architects of the best period used fixed standard multiples for all heights as well as for other proportions, and first made a geometrical design of their buildings. Then, having determined the point of view from which the building would be best seen, they taking this point as a centre, struck the arc of a circle from it with the radius of the distance to the base of the columns, and on this arc laid out the relative proportions of masses and mouldings as determined in the geometric drawings (Fig. 41). The actual design was then corrected to agree with the lines of vision passing through the divisions of the arc. The fact that the dimensions of various parts do not accommodate themselves to a ratio is accounted for by this correction of the geometric drawings.

THE GREEK DORIC ORDER (Fig. 38-A B C).

SHAFT

In analyzing the mouldings of the Greek Doric Order and taking first the shaft, it is found that there is no base, with few exceptions, such as the order of the Temple of Zeus at Akragas or Agrigentum, of the fifth century B. C., in which the shaft had an ill-conceived base of fillets with a top cyma, and in that of King Attalos at Pergamon, in which there is a plain base.

The shaft has sixteen, twenty or twenty-four flutes with sharp arrises, the flutes shallow and elliptical, terminating at the top in various ways.

The shaft has at the top the echinus, which has a very beautiful hyperbolic curve, which became less in projection, and less full and more subtle in curve, as the style was refined. At the base of the echinus a series of fillets made a delicate texture tone, and defined it from the shaft; while frequently below these, and just below the termination of the flutes, a series of channels defined a necking or border at the top of the shaft. The fillets usually have their upper surfaces at right angles to the face of the echinus, and are hollowed on their lower surfaces, forming half flutes; occasionally, however, they are full flutes as at Thoricus. They are used to give texture tones only, and are seldom varied in size, being repeats of one unit. The channels are V cuts following a section of the flute. They are omitted at the highest development of the style. The

abacus is a square block of diminishing projection as the style progresses.

EPISTYLE

THE EPISTYLE or ARCHITRAVE or lintel is in most cases plain (exception at Assos), though at times decorated by metal circular shields.

TENIA

The fillet or tenia between epistyle and frieze is plain with squared edges. The triglyphs have V cut channels.

BEDMOULD

The bedmould in the Doric order is small, in fact in one section of the Parthenon it does not exist, while elsewhere a bird's beak moulding is sufficient. The facia of the corona is broad, firm and strong, and has above it the protecting drip mould, which varies in character, being at times a bird's beak moulding alone with a fillet above, and in the Parthenon a cyma and fillet. Above this is the broad cymatium which also runs up the slope of the pediment, and which in the Prophylea and Parthenon is a simple curve, not a compound one. These mouldings are all sections of ellipses, hyperbolas and parabolas, with occasionally portions of circles, and are of three classes as shown, of single, double or triple curves (Fig. 15). The mutules below the soffits develop into brackets and corbels, and modillions in Roman and Renaissance designs.

Interior cornices are lighter, and often are terminated by the bird's beak at the top, and a cyma reversa at the bottom. In most cases in Greek cornices soffits are pitched backward and upward, and if large are cut on the curve of an hyperbola.

In the Doric style channels often do the work of fillets, giving great refinement of effect. It should, however, be considered that Doric architecture was polychromatic and that surfaces of different colors came into direct contact and were defined by these channels, which also served to guide the brush, and reinforced and made clear forms that if of but one color would have been vague in expression.

THE GREEK IONIC ORDER (Fig. 38 D E).

IONIC

The parts of the Ionic order are the same as the Doric, except that the columns have bases; the triglyphs disappear, the frieze

becoming one surface, and dentils appear in the bedmould, and the mutules disappear while the capital is the chief distinguishing mark of the style.

POLYCHROMY

The polychromy of the earlier style had gradually become less, and carved surfaces superseded painted ones. Colors were no longer in broad masses, as on the backgrounds of the metopes in the Doric order, but the carving is delicately picked out in red and blue and green and gold, the gold or gilded bronze eventually attaining the ascendency, so that certain examples were almost entirely the white of the marble and gold of the bronze. Natural materials, without the assistance of a covering of stucco, are more evident than in earlier times.

The mouldings maintained the same relative places as in the earlier order, as indeed they do throughout the classic styles; there are, however, new units and subdivisions of parts, which change the character of the entablature.

The bases are in most cases variations of the so-called Attic base (Fig. 70) which is composed of a heavy torus at the bottom with a light one at the top, and a strong intermediate scotia, all of which are defined from each other by small fillets, the channels of the Doric polychromic order having disappeared.

It will be noticed that the earlier examples of the order have no square plinths to the bases, the lower torus being set directly upon the stylobate; in this respect these bases resemble those of Persepholis; in fact, the Ionic order owes many of its factors to eastern precedents. The Persian base, as has been stated, is strongly suggestive of leaves bound around the base or a shaft, but turning downward, the band by which they were bound forming the upper torus or rope moulding. In some cases the leaves were omitted and the torus set upon a double plinth. From either of these forms it is not far to the Bassae base or to the smaller bases at Priene.

These Ionic bases often have the upper torus fluted with simple flutes or alternate flutes and channels, and occasionally the lower torus is beaded.

BASES

The bases of the Mausoleum of Halicarnassus and of the temple of Athena at Priene are unique in having the upper torus the domi-

nant member, and seem to be refinements of the type represented in the base of the Zeus temple at Agrigentum, while the Bassae base and the Priene ante-base are very suggestive in profile of the Persepolis bases. The Bassae base is so well determined as to its members that it has formed the antitype of most bases in all styles; in fact, it answers all the conditions of the requirements of a wall or shaft-foot in the best possible manner; and is to be found in examples of Gothic or other styles where the antecedents of the base are purely structural, and has come to resemble the attic base, by the natural adoption of a strong bottom moulding and a less projecting top one, allowing the bottom to be seen, with an intermediate hollow for contrast. In some of the bases, the lower tori have a peculiar up-cast of form, evidently to obtain broader shadow on the under side; they show the care with which the Greek studied the effect of mouldings.

The shaft has twenty flutes, which are separated by narrow fillets or arrises; these flutes always terminate in one manner, i. e., they have rounded niche-like ends.

CAPITALS

The capitals have the well-known Ionic scroll, of which the Bassae capital indicates most nearly the derivation from the universal early method of crowning a vertical form, i. e., by radiation of lines at the top (the ends of the lines) in order to strongly complete the form, being turned into a scroll. Nothing could be more natural than this method; the entire tendency of organic form is to flower or radiate at the top; and there must be some method of terminating the radial lines and filling the spaces between; the simplest possible method was to make them turn in on themselves, thus producing the volute. There is but little doubt that the suggestion may have come from the representation of the lotus calices bound at the top of the posts as decorations in this particular case; but we have only to compare ornaments as far apart as are those of China, Norway and the South Sea Islands to ascertain that a scroll termination is no unusual thing. Bracketed tops to shafts with scrolls painted are also considered as suggesting Ionic Caps.

VOLUTE

The Ionic volute is the chief and most beautiful example of mouldings which, while having the same character of section throughout, vary in proportion and in surfaces constantly as they

follow the volute. Few of the Greek Ionic caps have corner horns. Few also have neckings as in the Erechtheion. In most cases the cap appears to be a refined and small Doric cap, with the echinus carved with an egg and dart mould, and the scroll interpolated between the echinus and the abacus, the latter becoming, in consequence, of slight thickness. The abacus is moulded with a cyma or other simple moulding.

EPISTYLE

The epistyle is divided into three parallel planes, advancing but slightly one in front of the other, of which the upper is the broadest. The subdivisions of these planes are announced by beads or by cymas.

The epistyle is separated from the frieze by a moulding, no longer the simple tenia of the Doric, but of compound curves.

FRIEZE

The frieze is either plain or decorated with continuous sculpture. In the early examples there is no more bedmould than in the Doric, but in the fourth century B. C. the bedmould increases, strongly accented with a row of dentils, with egg and dart below, and cyma above. This dentil course may be the reminiscence of the corbel course of brick at the top of Persian brick walls or of projecting ends of small beams. It is to be found at Khorsabad and Persepolis. It appears in all brick architecture, and was very richly developed later in northern Italy. This Ionic bedmould is the beginning of the extremely rich decoration of the top of the wall and the soffit of the overhand which developed under the Romans. With a heavy bedmould, acting as a hand to sustain the projecting cornice, the advanced facia can be, and is, at once lighter, while the cyma recta is richly decorated.

The whole character of the Ionic style is much lighter, more graceful and delicate, than is the Doric and therefore it has been called the feminine style. Its cornice with the bedmould begins to assume the facial angle of 45°, which has become a convention in the designing of entablatures; and while maintaining a great simplicity in all its parts it is much freer than is the Doric style.

THE GREEK CORINTHIAN ORDER (Fig. 90)

CORINTHIAN

The Corinthian order though developed in Greece in the fourth century B. C., was especially used by the Romans, and is considered best in connection with their architecture. In Greece there was little difference between the proportions and mouldings of the entablatures of the Ionic order and of the Corinthian, as is shown in a comparison of the profile of the Erechtheion and of the Choragic Monument of Lysicrates and the Tholos of Epidaurus, and at Eleusis. The capitals, however, are totally different from each other in the two orders.

CAPITALS

Metal had been constantly used in the East in connection with architectural forms, and in the Ionic order, and especially upon smaller objects, there are evidences of superposed metal, and of metal origin. The leafage is of such a character, with so much roll at the top of the leaves, and with such delicacy of outline, that it seems improbable that it should have developed from stone carving without a suggestion from some other craft; and as the acanthus, of exquisitely delicate and modelled gold or bronze plates, fastened around the stem or crowning an upright, is not an unusual ornament in early Eastern metal work, it would seem probable that these stone leaf forms were suggested by the metal leaves. The swell of the leaf above the astragal, as if it were applied upon a central drum, appears to corroborate this view. In the floreated stone caps of other styles developed directly by stone cutting, the face of the leaf is more often a continuation of the vertical line of the column.

As has been stated, the structure of the Greek Temple produced the Greek Doric Order. The Ionic Order and the Corinthian Order possess the same integral factors of structure, the difference between them being in the expression of the parts only.

The wall has nothing to do with the development of the orders, of which the factors are the column and the structure above the column, the so-called entablature.

The roof has nothing to do with the development of the orders and few individual mouldings relate to it. The pediment or roof

gable has the same mouldings with occasional changes as are used in the Entablature.

COLUMN

The column has, at first, few mouldings. The parts of columns are the base, the shaft and the capital. The Greek Doric Order has no base. The shaft was cut 16 sided and the resultant planes were grooved and made into concave flutes which met with a sharp wedge or Arris.

CAPITAL

The Doric cap had a square block or abacus at the top below which was the one definite moulding, annular, as it followed the shaft plan, and an ovolo, or Echinus (shell). The early section was robust, the curve later becoming subtle with a hyperbolic section, until, in the fifth century B. C. it was almost a straight line. In certain examples, influenced probably by forms in Asia Minor, a hollow occurred below the Echinus.

In most cases several channels defined the change from shaft to cap but no necking or astragal appeared. There were no mouldings upon the abacus. Ornamentation of structure was by color, not by carving.

In the Egyptian bell capital a roll moulding was at the base of the capital. In Asiatic examples of scroll ornamented capitals, the Echinus was placed below the scroll and the Ionic capital was formed.

ASTRAGAL

The roll moulding below the Echinus on the Erechtheion capitals was slipped down below the capital, leaving the so-called necking and the roll, now a bead just above a congee, becomes the astragal, an integral moulding of classic capitals.

The Astragal usually a bead and fillet defines the joint between the shaft and the capital.

BASES

The Greek Doric had no base. Cretan and Egyptian columns had circular discs or bases below the shaft. In Central Asia, Assyria, Persia and in Asia Minor these discs became higher and were elaborated with mouldings.

IONIC BASE

An upper and a lower torus was used with a Scotia between them and fillets separating the curved sections and the Ionic bases

appeared, at first with the upper torus the larger, later with the lower torus the larger and the so-called Attic base was produced. It had, however, no square plinth block below it and was circular in plan.

Carving at this period was superseding polychromy and the base mouldings became carved, it is doubtful if they ever had been painted. The Corinthian order adopted the Attic base. Consisting of a lower large torus and smaller upper torus. The tori were frequently fluted horizontally, the column fluting having provided the suggestion.

It is obvious that few mouldings developed from the shaft, and that most mouldings appear upon the structure above the shaft, i. e., the Entablature. No further elaboration of mouldings upon columns, bases or capitals has ever improved their aesthetic value.

ENTABLATURE

The Entablature of the Classic Orders is composed of three parts (Fig. 38):

EPISTYLE

First, the lintel or beam, immediately above the columns, known as the Epistyle (from the Greek, upon a vertical or column) or architrave.

FRIEZE

Second, the space above the Epistyle up to the projecting eaves and cornice, known as the Frieze.

CORNICE

Third, the projecting Cornice. In the Greek Doric the Frieze has upon it, over the axis of each column and also centred between each column, the so-called Triglyphs derived from ends of the ceiling beams resting upon the lintel. In other orders the Frieze is a surface, upon the same plane as the Epistyle, the division between the two being indicated by a fillet, the Tenia.

CORNICE
BEDMOULD
FACIA
CYMA

The projecting cornice is formed of three parts. First, the Bedmould at the top of the Frieze, a small member aiding in the support of the main projecting stone of the Cornice. The cornice is derived from rafters cased at their ends and underneath. The rafters and their end casing form the broad Facia, the one plain

surface of the cornice and its strongest structural form. This Facia is the second factor of the cornice, the third being the gutter mould or Cymatium above the Facia.

TENIA

The simple Tenia became a fillet and a cyma, or a fillet-ovolo-fillet, and at times a bead with a fillet below.

Later the Epistyle is divided into two or into three parts, with a small bead inserted at the lines of subdivision. The cymatium, a cyma reversa in Greek Doric, becomes a cyma recta in Ionic and Corinthian, and has below it as an auxiliary a bead with fillet, or a bead with fillet and cavetto, a fillet with a cyma reversa and even at times a beak moulding.

The change from vertical to horizontal elements of structure is announced and challenges attention by the details of the capital.

The slight change from the Epistyle to the Frieze, both in the same plane, is defined by a small and simple moulding. The termination of the Cornice, i. e., its top line, is acknowledged by a large but simple moulding, but the advanced plane of the Facia of the cornice occasions rapid and various developments of the bedmould below.

BEDMOULD

At first the bedmould is only a bird's beak and fillet, then mouldings composed of ovolos, cavettos, and cymas separated by fillets appear and the bedmoulds become wide and complex and have decorated facias introduced which in the Ionic (derived from Asia Minor) and finally in the Corinthian the bedmoulds are enriched by scrolled carved brackets or modillions (Fig. 90).

In the bedmoulds therefore are to be found the richest mouldings.

ARCH

As the arch is in one sense a bent beam the Epistyle section is carried over the arch and it is also carried around door openings, as is indicated by the common name for the door trims, i. e., Architrave.

With the substitution of carving for polychromic ornament the minor mouldings increase in width to afford sufficient surfaces for the ornamental carving.

ELABORATION

This tendency towards elaboration therefore is constant for the mouldings, and gave the plane surfaces a richly and even superfluously ornamented character which begins to show itself by the time of Nero in the second half of the first century after Christ, but which was checked by the admiration of Hadrian for Greek Art, and occurs again under the Antoines at Palmyra and Baalbec and becomes very redundant in the early part of the fourth century under Diocletion (Fig. 90).

As has been mentioned the principal characteristics of Roman mouldings, as compared with the Greek, from which they were imitated, is that their sections are of parts of circles, while the Greek sections are developed from parts of ellipses, parabolas, and hyperbolas.

ECCENTRICITY

During the decadence of Roman architecture in the fourth century A. D. the integrity of simple structural features was not always maintained, and there appear exaggerations of the forms and of the mouldings of the established orders, for instance, the surfaces of frieze becomes convex as if the stone were squeezed out between the lintel and the cornice; and all mouldings were made excessive and clumsy in scale. These eccentricities were later imitated in Renaissance Architecture (Fig. 90).

Various combinations of mouldings in Classic Entablatures are shown in Fig. 71.

CHAPTER XI.

EARLY CHRISTIAN ARCHITECTURE.

EARLY CHRISTIAN

The early Christian art of Rome and of Byzantium is not prolific in mouldings. In Rome, classic fragments were directly incorporated into the buildings, and there was an occasional attempt to imitate classic forms, in which the mouldings were flat and characterless.

BYZANTINE

Byzantine art was essentially one of incrustation, the vast surfaces of the buildings being covered with marble slabs and with mosaics.

There is one constant and universal moulding, the bevel, its plane varying in angle, and associated with a number of fillets. This moulding is usually carved.

Wherever there are suggestions of classic forms they have lost all vigor and are unstudied in relative proportions.

In metal work the mouldings are either beads or straps reinforcing bands around openings in which are jewels. As in all primitive or barbaric work there is quantity in place of quality.

A very favorite type of ornament in Byzantine work is that of a number of parallel fillets or beads which form borders or stems to ornament. In fact, there are very few profiles of mouldings in European work from the fourth to the ninth centuries which repay study.

ROUND ARCHED ARCHITECTURE.

GOTHIC

With the growth of the round arched ecclesiastical buildings in Lombardy, France and England begins the great constructive period of Gothic art, in mouldings of which, like the architecture, are the direct outcome of structural conditions, and of the materials in which they are made.

The early Gothic mouldings are bound by no conventions, but develop from the simplest of forms into the most complex and intricate; and as the style becomes general, the variations develop peculiarities which become conventions. Yet Gothic is always a free style.

The first endeavor of the builders of the round arched architecture was to make their churches as dignified and impressive as possible. They often had not the skill to construct arches of huge spans, but they could make up for that lack by constructing many small arches, both as arcaded and as concentric arches one above another; hence the many superposed arcades of the Lombard churches, those arcades which became such a persistent and universal type that they are to be found everywhere, in cornices, ascending pediments, across facades, and even used as decorations of fountains and other smaller objects.

Corbels, string-courses, parapets, all were arcaded; and with this perpetual adoption of rounded form it was but natural that mouldings should partake of the same tendency.

Military architecture had also its influence upon these early constructive forms. Galleries and eaves supported upon heavily projecting corbels and rafters, and splayed openings, each gave the suggestion of new forms (Fig. 79).

At this time glass was rare and not yet adapted to close wall openings, which were either filled with sheets of horn, or more frequently were unsealed. The desire to obtain as much light as possible with as little actual opening naturally occasioned narrow openings in the heavy walls, with chamfered or splayed jambs.

STONE DERIVATIVE

The successive retreating planes at once determined the scheme upon which Gothic jamb and arch mouldings were to develop, either on the wall plane of the uncut blocks or on the chamfer plane. The mouldings in every case are formed out of the solid block, and seldom project beyond it. In analyzing them, there will be found to be a material difference between those of England, France, Germany and Italy (Fig. 69).

GOTHIC.

The Gothic mouldings differ naturally from all others in that they are derived from the conditions of stone construction, and are not merely reminiscent of earlier constructive forms.

They thoroughly accent and express every nuance of the construction and having once accomplished the purpose, in place of crystallizing into conventional types and established orders of architecture, the Gothic mouldings are free to the verge of license, in profile, in composition and in proportions.

As in the classic orders the mouldings in Gothic are at the points of juncture of constructive units, and they cluster even more about the articulations of the different parts of structure; but the Gothic style is one of general intention, not of hieratic following of tradition.

There are no Gothic orders of architecture; and while the work of different periods is manifestly individual, as is that of different localities, and for the sake of reference, there has been division of nomenclature made in the Gothic modes of expression, all the types, early English, Transitional, Perpendicular, Flamboyant, etc., fuse and flow together as naturally as minor streams are merged into a river.

JOINTS

As in the case of the round arched architecture (which has been named Romanesque), in the successive retreating arches about openings the corners were chamfered, rounded, beaded, columned, and finally groups of the various forms were adopted, making rich and deeply moulded jambs to openings (Fig. 69).

The mouldings of these jambs were carved around the arches, so that by the thirteenth century, which is the century of the height of Gothic architecture, there was a well established habit of treatment of the jambs of all openings, with mouldings of more or less complicated section, derived in a very complex but straightforward fashion from the conditions of the preceding centuries, of stone cutting and of wall building and of entrance ways for light and air.

The true Gothic architecture is that which, by a marvellous correlation of piers and vaults, buttresses and weighting pinnacles, is in a stable equilibrium so carefully adjusted that no constructive element of it can be exaggerated excepting at the risk of detriment to the whole. It is a fabric of thrusts and counterthrusts, the apotheosis of constructive principles in stone.

Its structure developed the groined and vaulted ceilings, the aisles and nave, the triforium and clerestory, and permitted the vast openings for windows in the curtain walls between the buttresses, which were only possible after the introduction of the manufacture of glass.

Again the mouldings accent the changes of constructive form; the great piers that rise from floor to cornice, and from which start the mouldings of the ribs of the vaulting, are at first a long column with the entire height crowned at the top by a cap that gathers within itself the radiating rib-moulds. Soon the column becomes a group of colonnettes, each diverging in a roll to do its individual duty in the vaulting above the capital.

As the mouldings multiply in the vaulting they multiply in the pier, and as the natural tendency in design is to repeat prominent motives in smaller details, all salient vertical angles partake of the character of the pier plan, and of the door jambs.

In nearly all Gothic design the vertical forms are the most manifest, but there is a well defined system of horizontal lines which gives additional apparent stability to the building.

The antecedent of the Gothic wall is very different from that of the Greek. The latter was of clay, or of stone covered with stucco, while the early walls antedating Gothic were of rubble.

A rubble wall of any considerable height is unstable, and requires not only bonding stones, but bonding courses of cut stone carried through the wall to strengthen it.

STRINGS

As all openings must have stone sills, and these openings gradually became after the introduction of glass greater than were the wall spaces between them, the sills made a bonding course, which was eventually continued around the building, so that sill courses

are a prominent factor in Gothic work. The bonding course was often placed just below the ends of the floor joists, and they naturally appear again as cap stones to the wall. As was most natural these string courses were projected to protect the face of the wall, and they at once were submitted to the same treatment as the door-jambs, being chamfered, rounded, hollowed and moulded in like manner. The sequence of forms is the same in both, excepting, as has been noticed, that by climatic influences the horizontal mouldings are affected by the sloping wash on the upper side, and by the drip moulding on the lower (Fig. 78).

ABACI

The same is true of abaci of the capitals, and of many forms where such utilitarian sections do not seem necessary, especially upon interior work. In fact, one of the few solecisms, committed in Gothic work is this, that the sections of the horizontal mouldings were largely established by exterior requirements, and that once determined, they were repeated within the buildings regardless of the fact that no rain ever fell upon them.

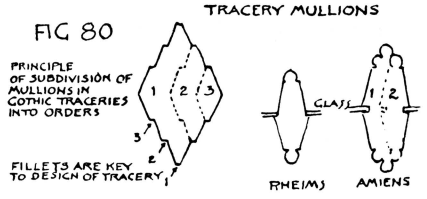
Wherever Gothic art grew from the midst of classic, it was flatter in its forms and mouldings, and less vigorously structural than where this influence was absent.

It seems as if Classic had nothing to give to Gothic, excepting possibly an incentive to refinement, while Gothic, on the other hand, supplied the Renaissance with a wealth of motives.

TRACERIES

The fault of this work is often its lack of restraint, and this appears strongly in the mouldings, which become more and more complicated, and finally bizarre and eccentric. There is often a superabundance of forms in the profiles of the Gothic mouldings, and a too great redundancy of convex forms contrasted with deep hollows (Fig. 69).

The tracery windows, which often appear very complex, are in reality extremely simple, being merely the development, through the system of chamfering, rounding and hollowing, of a rectangular stone mullion (Fig. 80). All copings are developed along the same lines as the string courses.



In the early buildings the walls were sturdy and thick, the openings small. There was no glass, and to obtain as much light as possible without enlarging the opening the opening was bevelled or splayed, at first on the inside, later on the outside, also in large openings instead of splays the jambs and arches receded in series, arch within arch, creating with the edge rounded mouldings the prototypes of the superb Gothic portals of the 13th century.

The pier plan becoming one therefore which at first was confined within an octagon and later a square turned 45 degrees from the lateral axis of the cell.

Because of the Gothic system in which the collonettes were each carried to the springing of the transverse and diagonal and wall ribs of the vaulting, this pier plan becomes typical of Gothic architectures. The progress is evident from the fact that early Romanesque retains its character of squared stones, with angles moulded, while the Gothic largely eliminated the ashlar surfaces in the piers, which become a collection of mouldings confined within the lines of the splayed square (Fig. 69).

It is to be noted however that early French Gothic, at a time when stone cutting had become skillful, used from tradition a heavy round column instead of a moulded pier, the mouldings starting above the nave arcade.

Another traditional form appears; the classic lintel with its tenia cleat was carried over the arch in classic work, the tenia forming an outside strong defining moulding to the arch.

LABEL

This defining moulding developed in later architecture into the so-called label moulding, defining the extrados of the arch and projecting in front of the ashlar. *The richest mouldings of the developed Gothic are derived from the relation of the pier and vault system.*

The other horizontal mouldings which do not imitate the classic but which are derived from cutting within the squared stone, were affected by climatic conditions. The northern buildings were subject to the injurious effects of ice, snow and thaw.

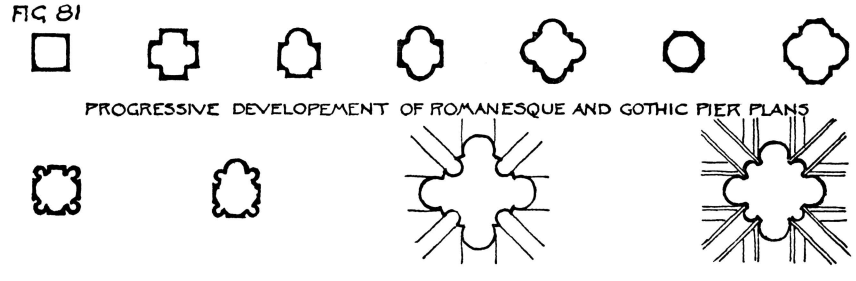
COPINGS

The top surfaces of copings, cornices and string courses were bevelled to dispose of snow quickly, as the roofs were high pitched for the same purpose (Fig. 64).

The soffits or under surfaces of projecting stone courses required treatment to prevent water from running back on the walls, and to force it to drip. From this developed the under-cut drip mouldings (Fig. 78).

PIERS

The piers, at first square in plan, became oblong and rectangular in plan with the length of the buildings, then as the aisles became vaulted a pilaster was developed upon the aisle side of the pier to take the transverse aisle-arch, creating a T-shaped pier, in plan, then a similar pilaster for a similar purpose on the nave side, creating a cruciform pier in plan (Fig. 81).



These rectangular piers are unmoulded from the sixth to the ninth century after Christ, when the pilasters appear.

The arches above meantime developed more members, the arch stones, or voussoirs, lying in receding planes known as successive orders and the ribs at the intersection of the vaults were brought down upon the abaci of the pier caps.

The arch section first developed mouldings and the pier slowly followed. The clustered pier took the place of the columns and

the rectangular pier; and its members indicated at once a support to vault ribs or to an arch moulding or to both. The square corners of the stone piers and pilasters were treated with the large roundel, which had the appearance of a colonnette.

These roundels early became detached shafts in England, but are more often an integral part of the column or pier which, in France, is frequently a monolith.

DETACHED SHAFT

In England the detached shaft is a single piece taking part of the arch load (most of which was taken by the central column or pier built up in drums) and was found to be structurally faulty and was abandoned about 1250 A. D.

The pier plan mouldings are simpler than the arch moulding sections until the 14th century, and with fewer hollows. The roundel or English bowtell is a characteristic Romanesque moulding (Fig. 57).

When the pointed arch appears the pointed bowtell took the place of the rounded bowtell in England, but was not so soon adopted in France.

About the middle of the 12th century stone cutters had not only become more skillful, but softer stone was used and deep hollows and undercut forms appear. Throughout the next hundred years Gothic is at its height of development.

From 1250 to 1350 the forms flatten and mouldings are simpler and fewer in France than in England, and less wirey in their effect, and with broader stone surfaces as contrasts to the curved sections.

The early mouldings were worked within the faces and soffits of a squared stone (Fig. 56).

Later the stones were chamfered before being moulded, which produced the mouldings with less bold sections and less contrasts of light and shape, which appeared in the fourteenth and fifteenth centuries.

Label mouldings are better omitted upon interiors unless they mark a change of material.

The arch mouldings being different from those of the columns or pier below were at first stopped upon and taken by the block of stone which formed the cap at the top of the column or pier. The

variations of Gothic pier and arch mouldings are so many that they can best be indicated by illustrations, and defy descriptions (Fig. 69).

DOSSERET

When from tradition or from any use of classic material taken from older buildings, a column and classic cap was used, a squared stone was often inserted between the classic cap and the arch mouldings called a dosseret.

This is especially used in Byzantine work of the 6th century and in some of the early Christian basilicas. In the 11th and 12th centuries this dosseret diminished into an upper second abacus and then was abandoned. The square block cap over a column had its lower corners rounded back to the column to set well upon it and when this cap was used the dosseret was omitted.

An inverted truncated pyramid of four sides with its lower corners rounded to form a circular base is one solution of the problem, a circular convex cap penetrated by an inverted pyramid of four sides is another. There are many variations of these initial types, the whole object being to obtain a stone block cap of which the lower plane is a circle in plan and the upper a square.

The convex cap proclaims the functions of support better than the concave and seems stronger and more vigorous, but can be very clumsy in effect (Fig. 76).

The concave capitals appear to have been imitations of the Roman Corinthian capital (Fig. 77).

The mouldings in capitals are usually confined to the astragal (the moulding between the shaft and the cap) which is either a bead and fillet, a pointed bowtell and fillet or a lamb's tongue and fillet; and the mouldings of the abacus, which develop on the lower edge from a bevel or from a bowtell, or from a cavetto or a bead and cavetto, and at the upper edge from a projecting fillet, and a cavetto-fillet-ovolo, etc., and finally the plane between the two becomes a hollow (Fig. 78).

Many variations occur; the persistent characteristic however is that the top of the abacus shall be strongly announced.

The detailed development of the mouldings is different in different countries, and at different periods.

CHAPTER XII.

WINDOW TRACERY.

The stone moulded treatment of the filling of window openings to hold glass, known as tracery, is one of the richest developments of utilitarian need.

Windows are merely openings in walls to allow light to penetrate.

Where little light was needed and where the mystery of dimness was desired they did not exist. The Greek temples were devoid of windows. The Egyptian Temples had openings high above the columns.

In lands with constant sunshine the size and number of the openings was minimized, for doorways permitted enough light to enter for utilitarian purposes, and shade and cool temperatures were maintained. Similar conditions exist today.

Great arches required only curtained walls within the abutments. Whether from this fact or from a sense of scale, when openings were made as in the great Roman baths, they were large, and were usually high under the arch.

But wind, rain and direct sun each were objectionable and to be minimized.

The large openings were filled with slabs of stone pierced with small openings.

This system was universal throughout Roman, Byzanthium, Mohammedan and early Christian work, up to the 9th century, at which time the grand scale of structural factors in buildings had largely disappeared, perforated slabs were abandoned and small unobstructed openings, at first few in number, took their place.

In the North, where more light was required, these openings were larger than in the South. At first the openings were single, later they were grouped in twos and threes and more (Fig. 82).

The walls were thick and to allow the light to spread as it entered, the jambs were splayed; at first upon the inside only, later upon both inside and outside (Figs. 83 to 87 inclusive).

In grouped windows this splay so cuts away the inside of the millions between the openings that no space is left to take the width of the arch-stones of the individual arches over the openings and as nearly all openings are contained under one arch spanning the group, the arched openings themselves having columns between them. Immediately that this condition occurs there is no thick wall needed under the main or discharging arch and between it and the small arches over the openings (Fig. 83).

The groups become separated only by the shafts or columns which shafts are soon repeated at the jambs and later the single windows are similarly treated (Fig. 84).

The interior treatment of the windows is richer than the exterior, the interior arches becoming elaborately moulded while the exterior may have only a squared jamb or a splay.

Leaded glass had made its appearance, but it was soon found that wind pressure upon this glass, even when it was reinforced by iron bars, would not permit the use of broad openings (in the apse of Rheims, the windows were 4 feet 7 inches wide and glass buckled badly). As a result, groups of narrow and high openings are maintained and large single openings are absent from Gothic work.

The plane of the glass was nearer to the outside of the wall than it was to the inside.

The space above the small round beads of the grounded openings and the underside of the containing or discharging arch required no great thickness and it became a thin wall or a slab of stone, which slab or plate began to be pierced with geometric openings; the edges of the perforations were bevelled, the columns separating the window openings were abondoned, and the mullions or little piers bevelled on all four corners and thicker through the wall than on the face of the wall were substituted (Fig. 85).

Columns being abandoned, caps were abandoned.

The perforations in the window heads or so-called tympanums were at first circles; then small circles, grouped around a central larger circle (Fig. 83).

These had both the outside and inside edges bevelled, and produced rose forms which also were placed within circular openings creating rose windows (Fig. 89).

By the enlargement of the central circle until it invaded the surrounding circles the so-called foils were produced, named according to the number of circles, not fused into one opening, trefoils, quartrefoils, cinquefoils, etc. (Fig. 87).

This compound foil now appeared at the head of the arched heads to the windows, and created the cusp (Fig. 87).

It has been mentioned that arch within arch, each receding, is characteristic of Romanesque architecture. *Each of these receding arches is known as an order.*

The jamb sections to the door and window openings correspond with the arch sections.

ORDERS

The outer containing arch to the grouped windows is the first order. The second order surrounds the individual openings of the groups and forms their jambs and mullions (Fig. 83).

At first two orders only appear. Later the openings of the groups are again subdivided, within each opening, and a *third and further recessed order is created. Seldom is there a fourth order, though in extremely elaborated tracery it sometimes occurs.*

The tracery that is formed by merely perforating the slab over the arched group openings is known as Plate Tracery (Fig. 84).

Its mouldings are simple bevels or bowtells or cavettos following the edge of the openings.

The progress of desire is that of obtaining as large openings as possible within the containing arch and in having the stone mullions and bars as slight as possible with constructive strength to hold the glass.

The edge bevels are increased inside and out until they almost meet, a small fillet alone separating them.

The mullion sections have strength in their depth through the wall, and are diminished as much as possible on the wall planes, the type of section becoming an elongated diamond with its long axis at right angles to the wall.

All superfluous stone surfaces between the geometric openings of the tympanum under the containing arch were perforated in

their turn until the section of the mullion was now used to separate all these openings.

BAR TRACERY

The result was a stone grill of the second order within the jamb and arch mouldings of the first order; and this grill was at times later filled by a corresponding smaller grill of the third order (Fig. 83-A).

The mouldings of the orders can be the same or can vary at will.

The result is known as Bar Tracery (Figs. 86-87-88).

The design of the grill is determined by the fillet between the bevelled openings, each order having its own design.

Plate Tracery became Bar Tracery in the early thirteenth century (Fig. 86).

The system is extremely simple, leading from utilitarian requirements and the limitations of materials to one of the most beautiful and elaborate motives in architecture, and is entirely produced by a lacelike net of fillets bordered on each side by mouldings. *It gains little by having the mouldings ornamented.*

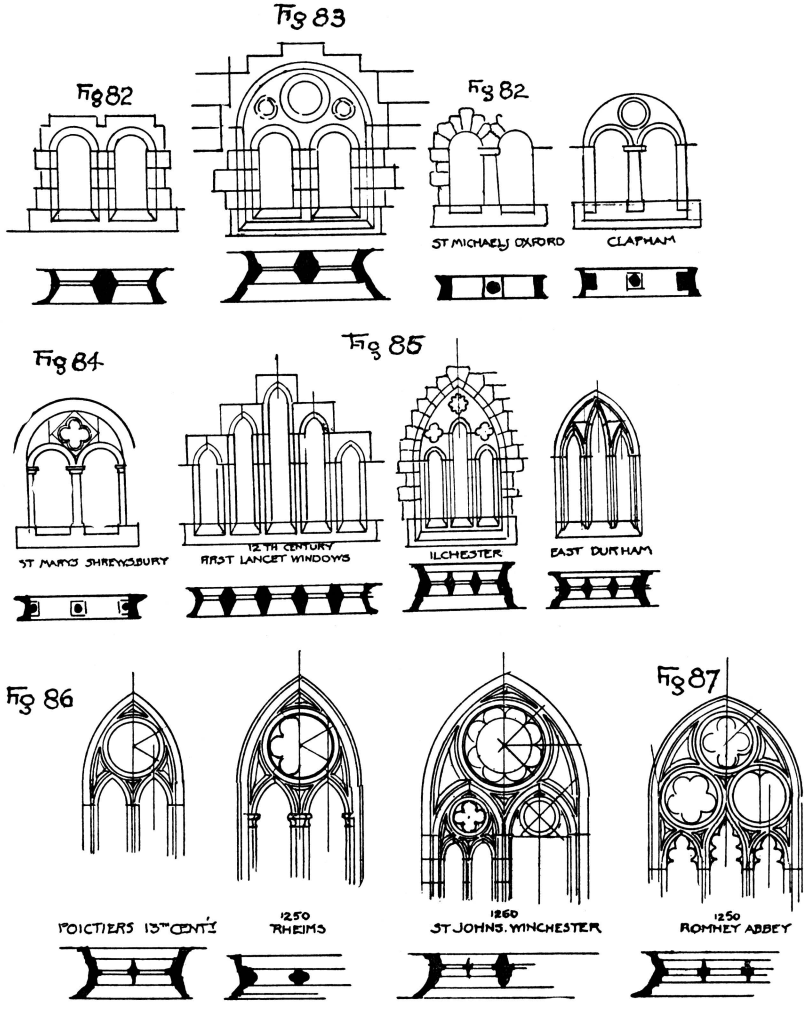
The effect of this apotheosis of mouldings is most deceptive, for the result seems intricate and at times bewildering, yet the system is extremely simple and the designs are effective from the shapes of the perforations and their relations to each other as well as from the flow of the lines of the design (Fig. 89).

With the advent of the Renaissance and the manufacture of larger sheets of glass, stone tracery disappears, though it persists in Francis I and Tudor mullions and transoms during the sixteenth century.

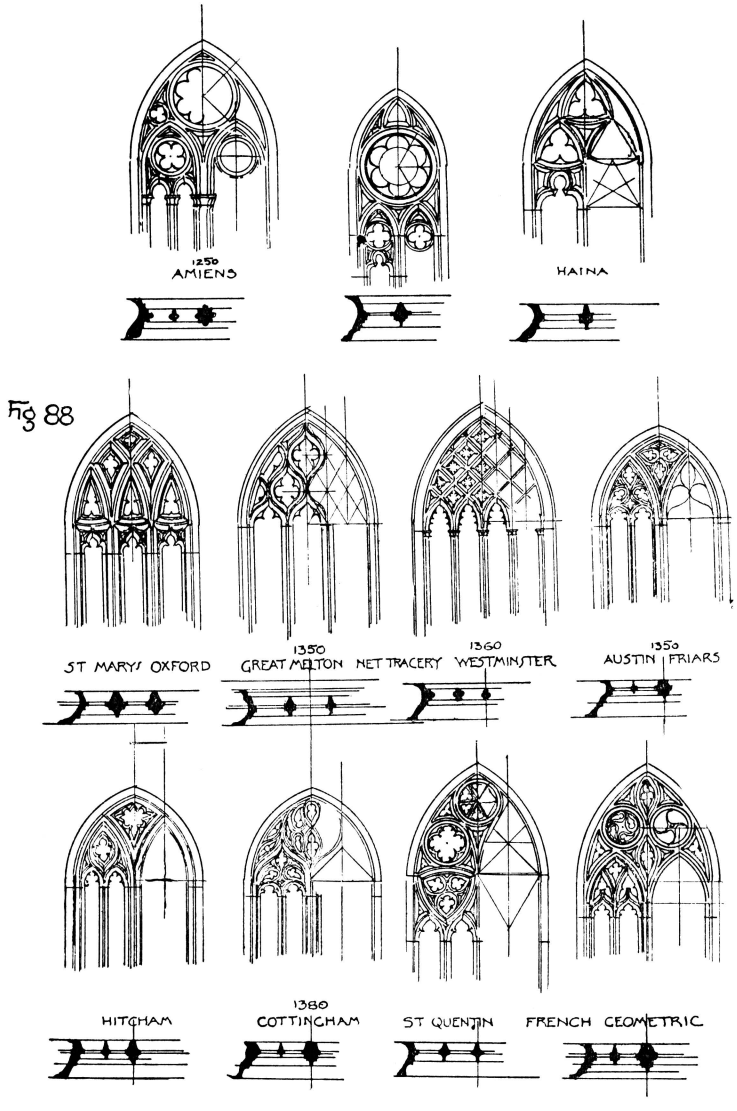
SILLS

The sills of openings are bevelled as well as the jambs and beads but only for the whole group in the first outside order, the mouldings of the second and third order being brought down on this level (Fig. 85).

In the fifteenth century German work and in some of the French work mouldings are made to interpenetrate each other with great ingenuity, especially in objects in the minor arts, but only an intricacy which piques curiosity is obtained at the expense of sincerity of structural expression.

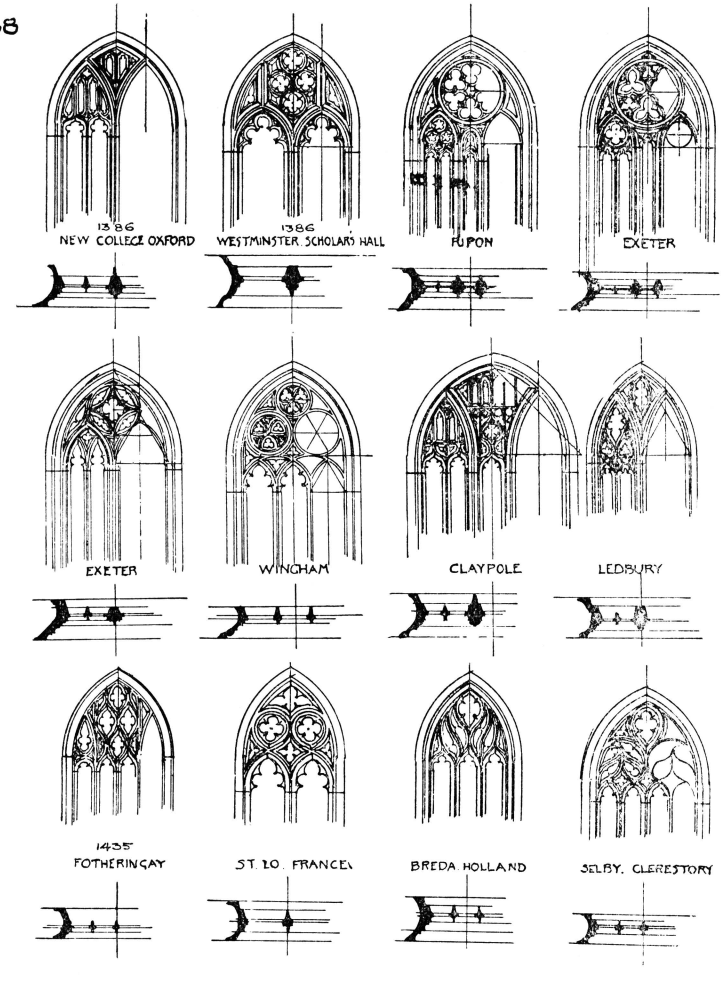


Gothic Tracery

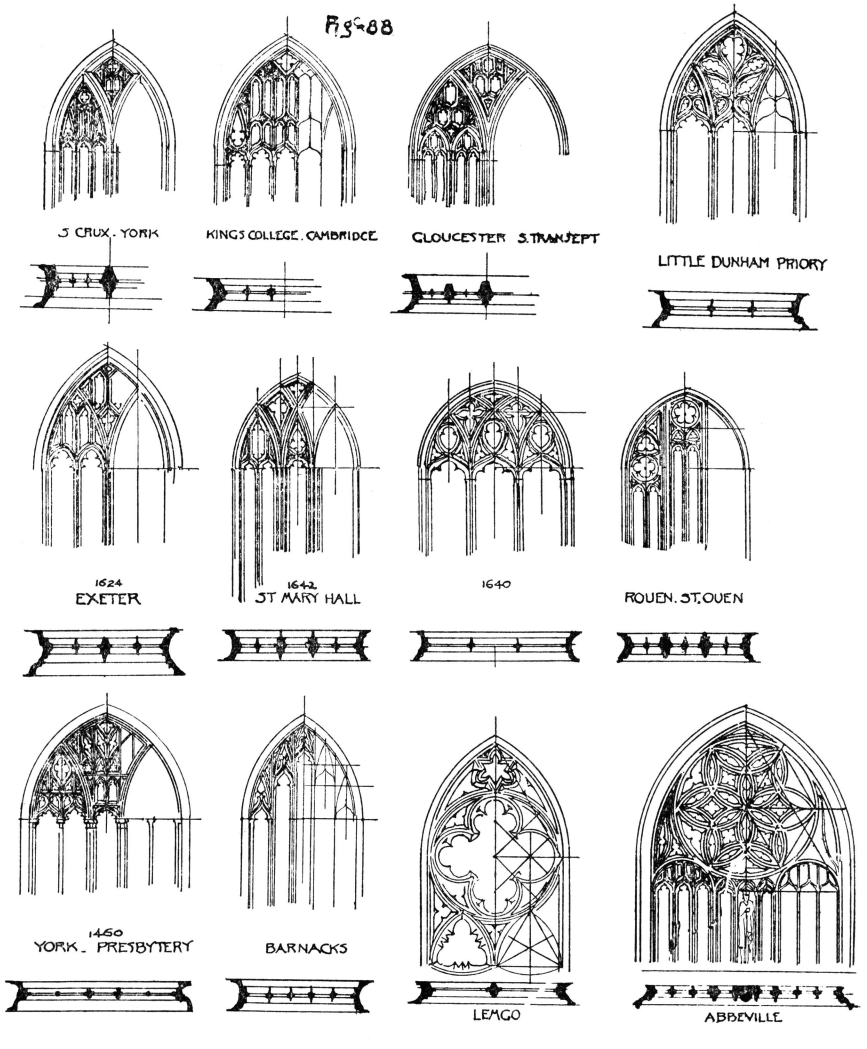


Gothic Tracery

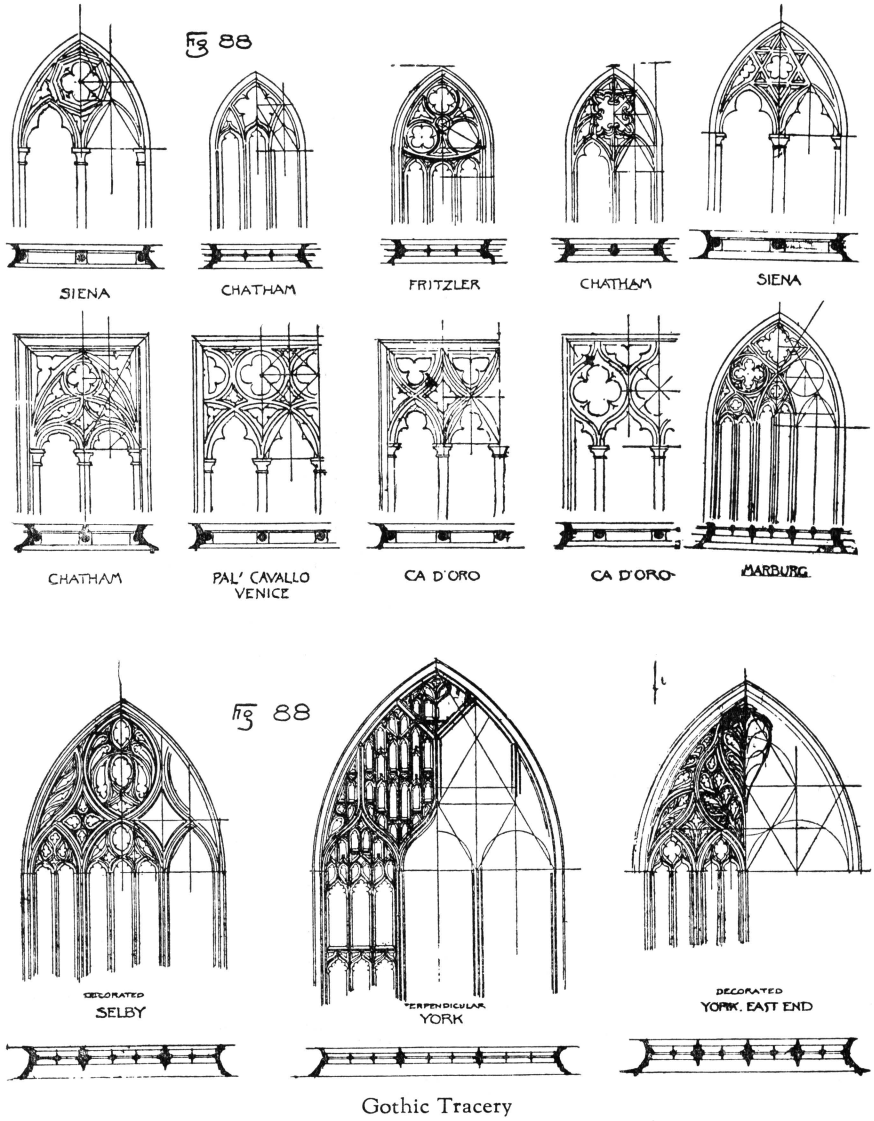
Fig 88



Gothic Tracery

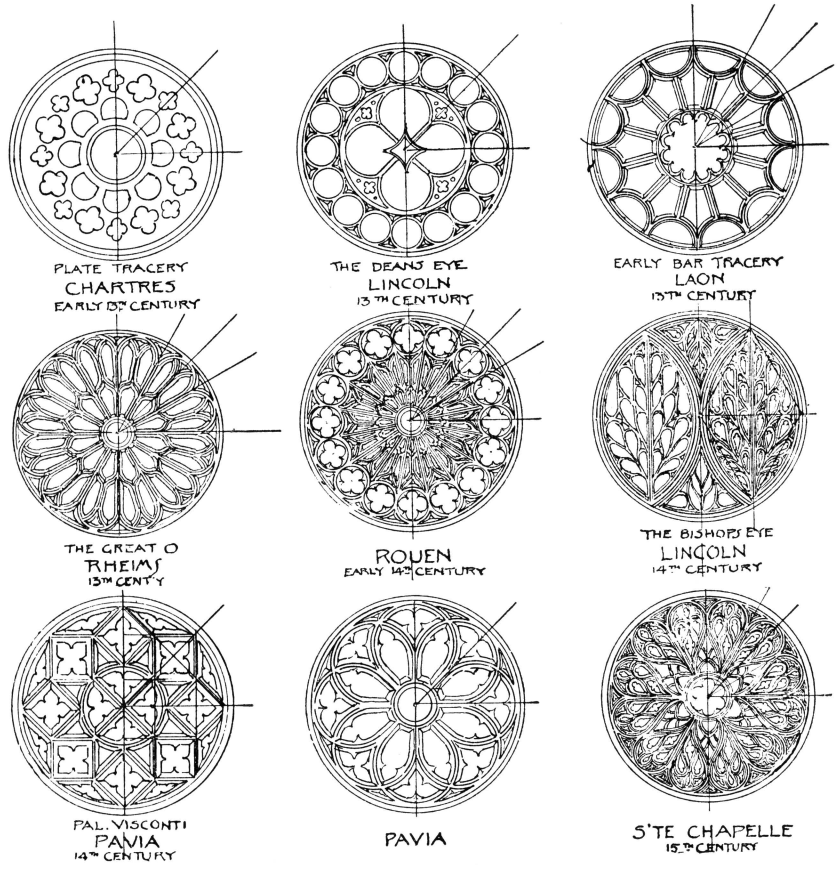


Gothic Tracery



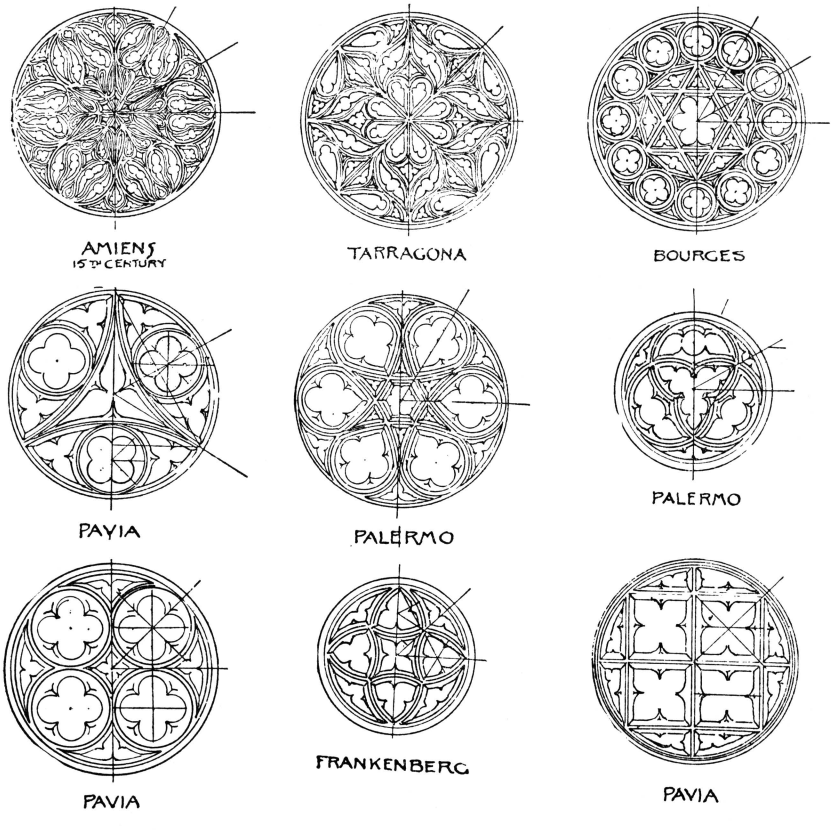
Gothic Tracery

Fig. 89



Gothic Tracery

Fig. 89



Gothic Tracery

Mouldings which butt or scribe against each other are of little value, sacrificing clarity of statement for picturesqueness.

Usually the more insignificant the object the more it is apt to court attention by eccentricities without which it would be overlooked.

The architectural motives of columns, arches, traceries, etc., were used around panels and placed as patterns upon surfaces, much as the classic orders were applied upon the face of structures which did not need them.

But the stone mouldings reproduced in wood showed at once their more robust derivations, and appeared coarse and heavy and a refinement and delicacy of treatment incompatible with all but the finest stone became necessary to adopt them to wood. This was done in the fifteenth century, but was neglected in the nineteenth century in the Romantic and Gothic revival.

Like the Gothic mouldings the Gothic traceries are so various that they can be better understood through illustrations than by description.

But it should be realized that the mouldings of these traceries are not indicative of primary structure, but of secondary, and are merely accessory detail to carefully designed openings, that they are in fact, refinements of the edges of delicate stone grills. All Gothic architecture was accented and enhanced by polychromy.

RENAISSANCE MOULDINGS (Fig. 90).

The mouldings of the Renaissance styles, while deliberately based by Brunnelleschi and his followers upon classic antecedents show the distinct influence of medieval forms and arrangement, especially in minimizing the widths of facias, and the use of corner rolls. Usually there is a tendency in Italian fifteenth century work to flatten curved sections, which tendency ceases with the more careful studies of Roman sections by Palladio and others, who were the inspirers of Inigo Jones in the early part of the seventeenth century in England and of Lord Burlington in the eighteenth.

The individualism of the Architects was very marked in their mouldings, having a gamut from the distinction of those of Peruzzi to the eccentricities of Borromini, and of Serlio. All logical derivation was ignored, and personal aberrations were rife.

FIG 90

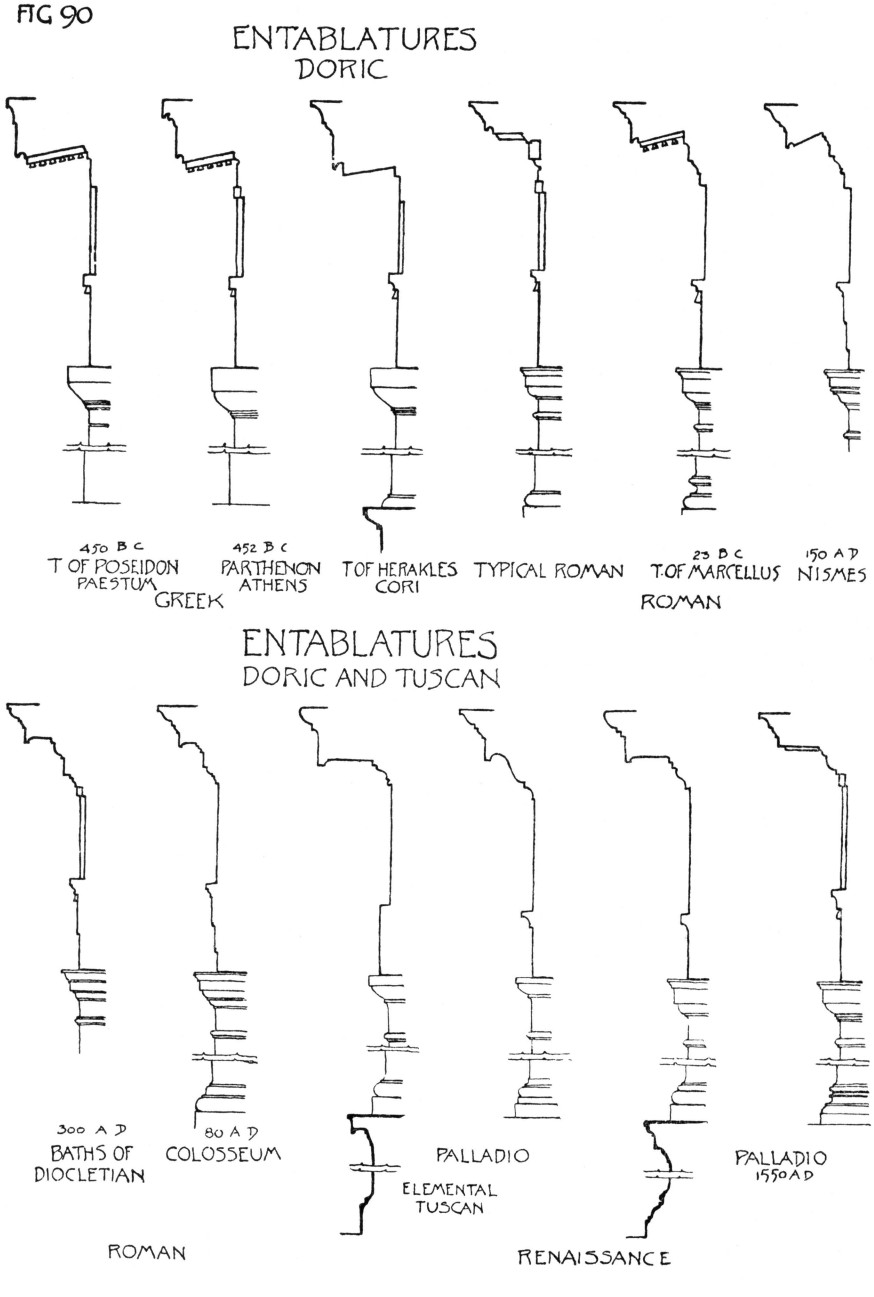

ENTABLATURES
DORIC
450 B C
T OF POSEIDON
PAESTUM
452 B C
PARTHENON
ATHENS
T OF HERAKLES
CORI
TYPICAL ROMAN
23 B C
T. OF MARCELLUS
150 A D
NISMES
GREEK
ROMAN
ENTABLATURES
DORIC AND TUSCAN
300 A D
BATHS OF
DIOCLETIAN
80 A D
COLOSSEUM
PALLADIO
ELEMENTAL
TUSCAN
PALLADIO
1550 A D
ROMAN
RENAISSANCE

FIG 90

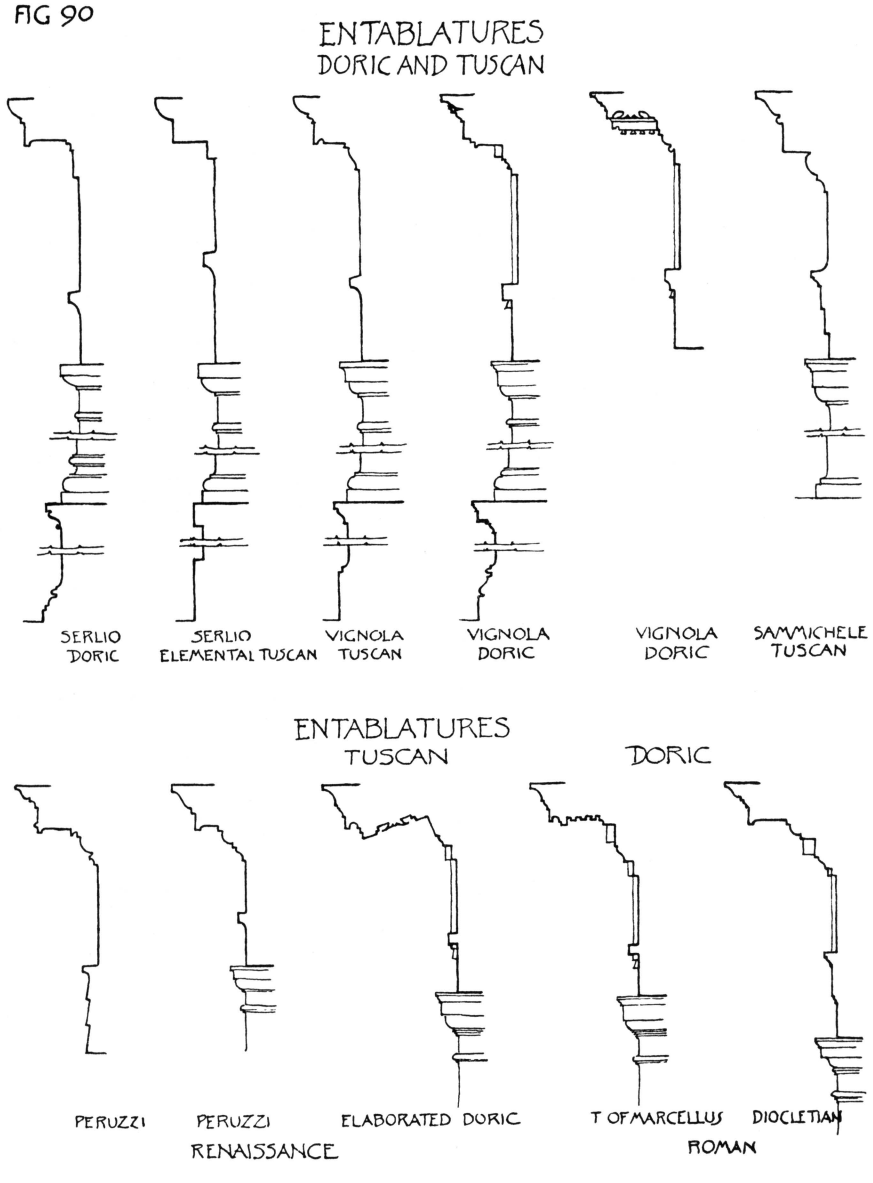
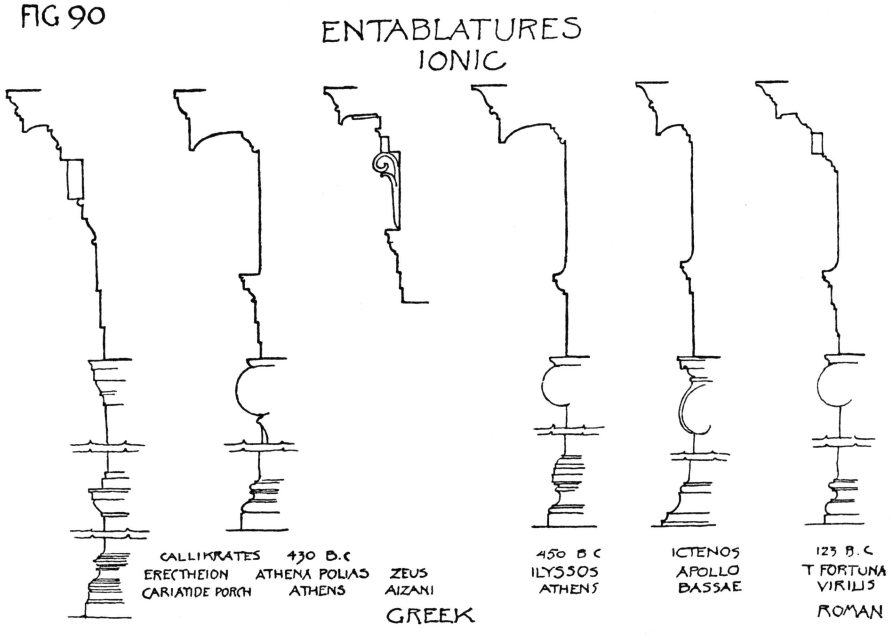

ENTABLATURES
DORIC AND TUSCAN
SERLIO DORIC
SERLIO ELEMENTAL TUSCAN
VIGNOLA TUSCAN
VIGNOLA DORIC
VIGNOLA DORIC
SAMMICHELE TUSCAN
ENTABLATURES
TUSCAN
DORIC
PERUZZI
PERUZZI
ELABORATED DORIC
T OF MARCELLUS
DIOCLETIAN
RENAISSANCE
ROMAN

FIG 90


ENTABLATURES
IONIC
CALLIKRATES 430 B.C
ERECTHEION ATHENA POLIAS ZEUS
CARIATIDE PORCH ATHENS AIZANI
GREEK
450 B.C
ILYSSOS
ATHENS
ICTENOS
APOLLO
BASSAE
123 B.C
T FORTUNA
VIRILIS
ROMAN

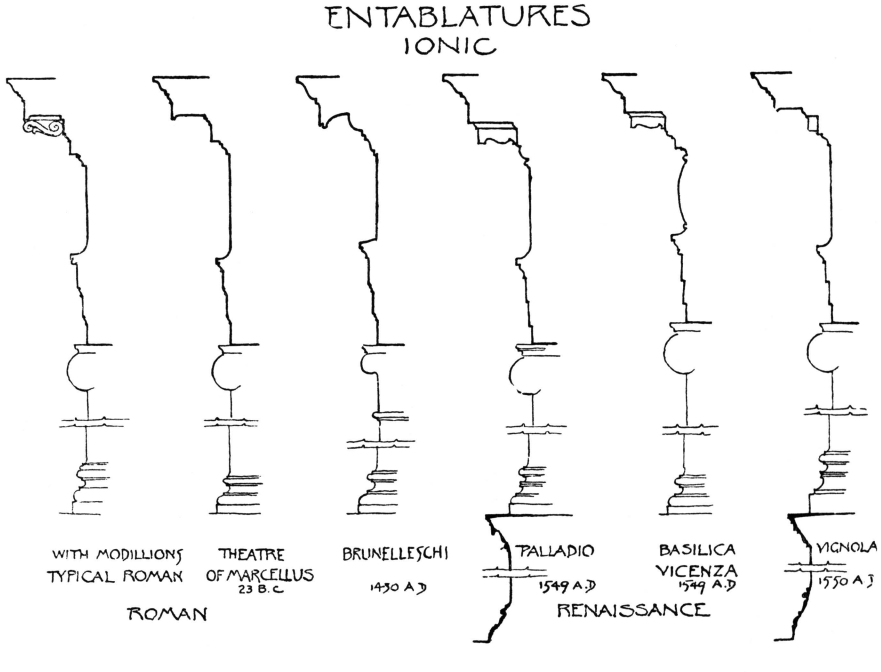

ENTABLATURES
IONIC
WITH MODILLIONS
TYPICAL ROMAN
THEATRE
OF MARCELLUS
23 B.C
ROMAN
BRUNELLESCHI
1430 A.D
PALLADIO
1549 A.D
BASILICA
VICENZA
1549 A.D
VIGNOLA
1550 A.D
RENAISSANCE

FIG 90

ENTABLATURES
IONIC

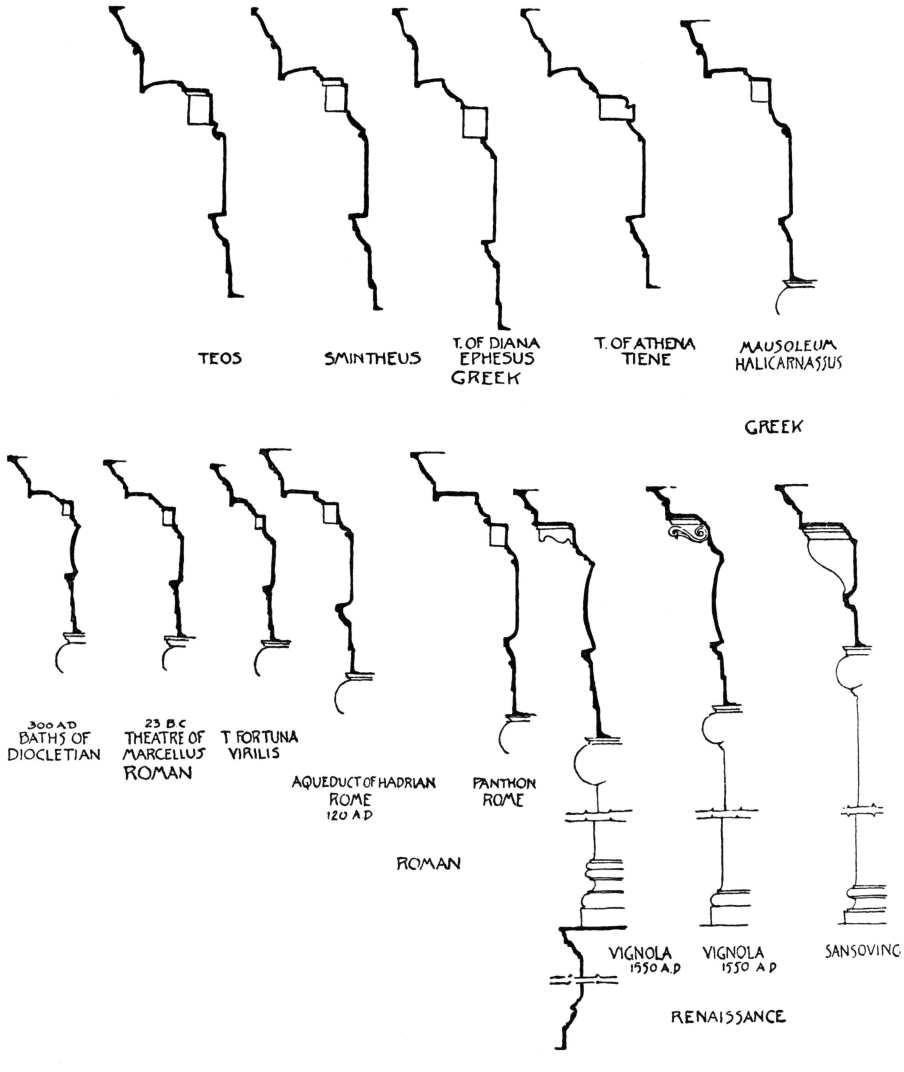
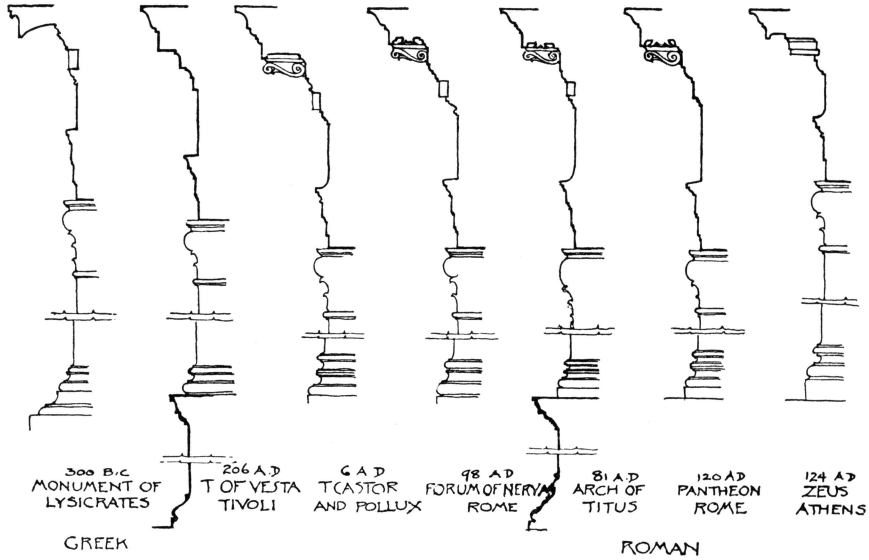


FIG 90

ENTABLATURES
CORINTHIAN



ENTABLATURES
CORINTHIAN

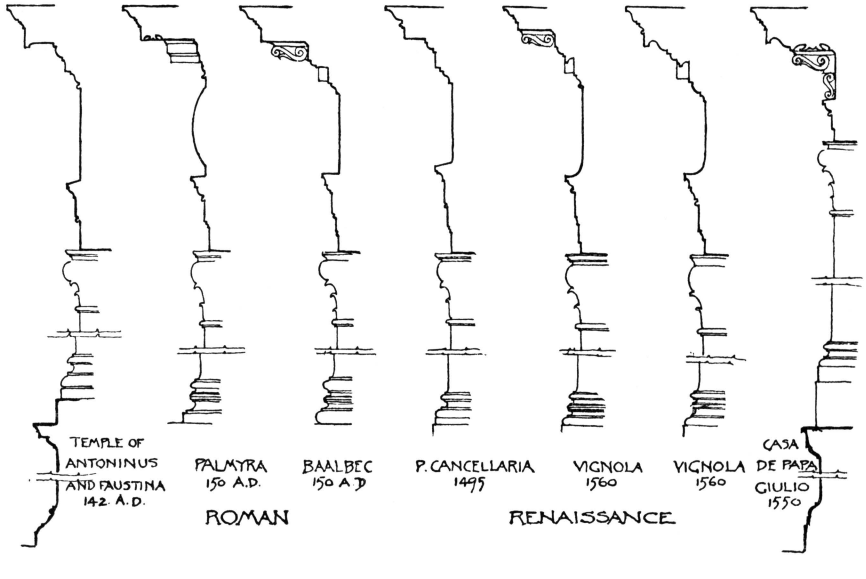


FIG 90

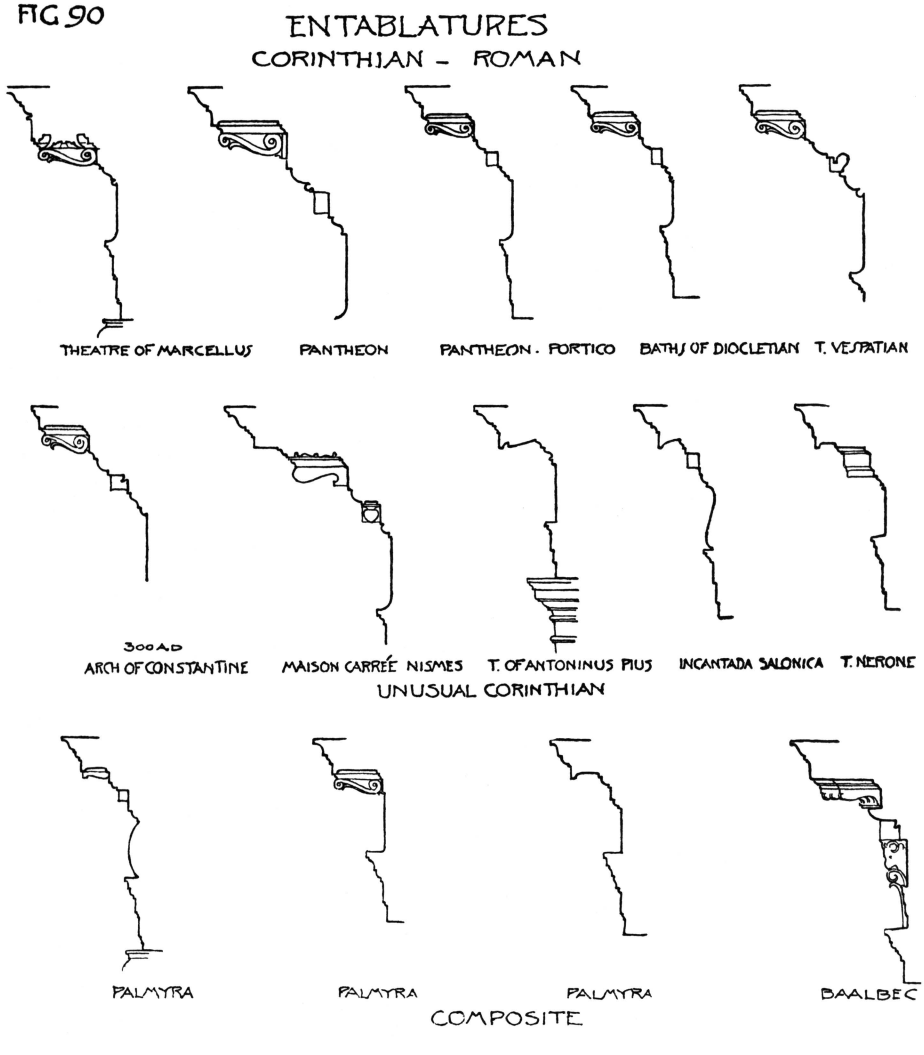

ENTABLATURES
CORINTHIAN - ROMAN
THEATRE OF MARCELLUS
PANTHEON
PANTHEON · PORTICO
BATHS OF DIOCLETIAN
T. VESPATIAN
300 AD
ARCH OF CONSTANTINE
MAISON CARRÉE NISMES
T. OF ANTONINUS PIUS
INCANTADA SALONICA
T. NERONE
UNUSUAL CORINTHIAN
PALMYRA
PALMYRA
PALMYRA
BAALBEC
COMPOSITE

FIG. 90

POMPEIAN MOULDINGS

TERRA-COTTA MOULDINGS

DORIC CAPITALS SHOWING FLATTENING OF FORMS

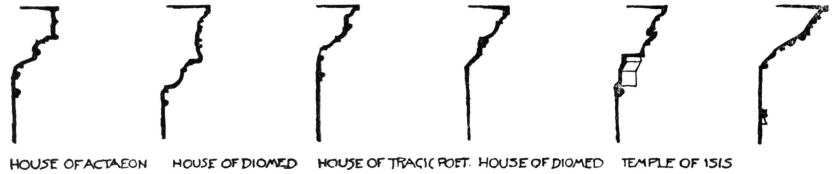
BASILICA

BASILICA

THEATRE

TEMPLE OF FORTUNA

BASILICA



HOUSE OF ACTAEON

HOUSE OF DIOMED

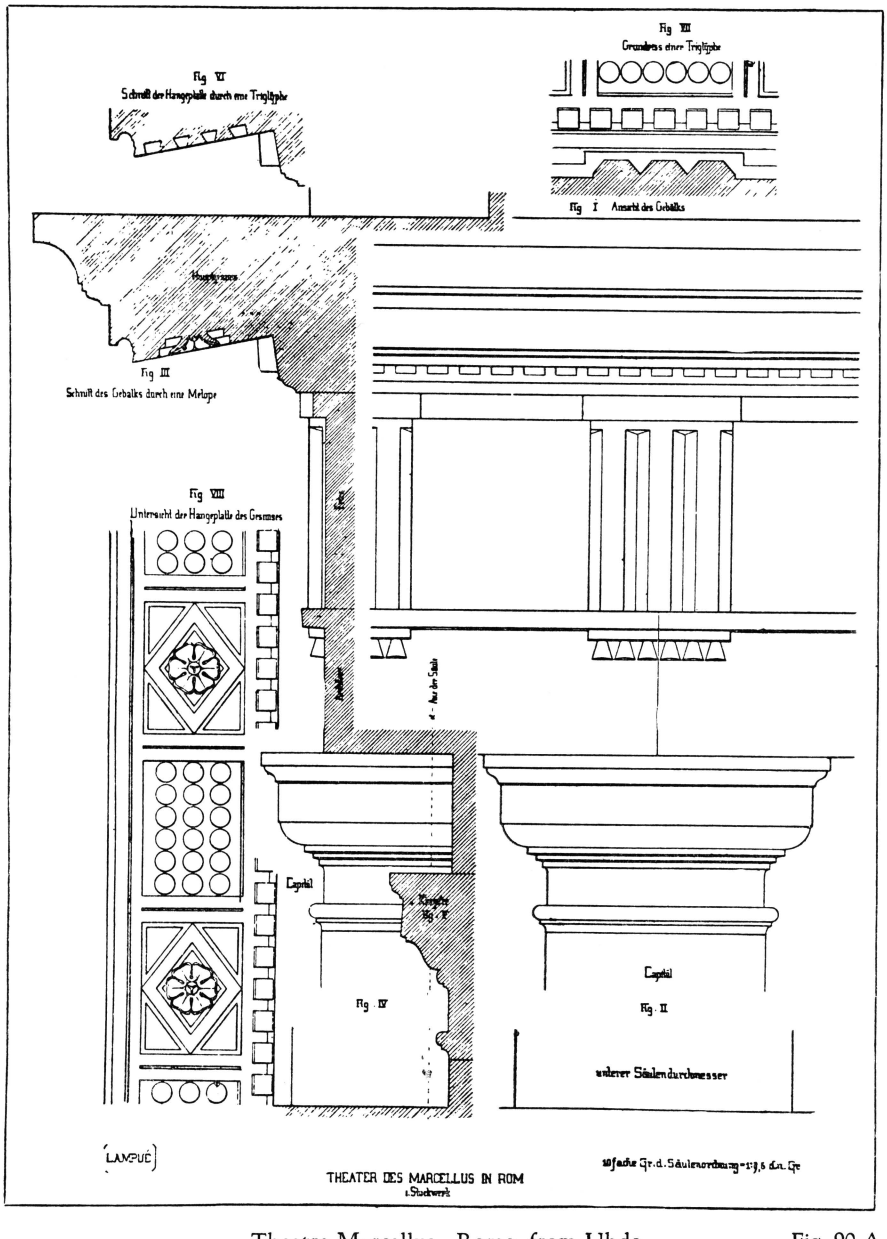
HOUSE OF TRACIC POET.

HOUSE OF DIOMED

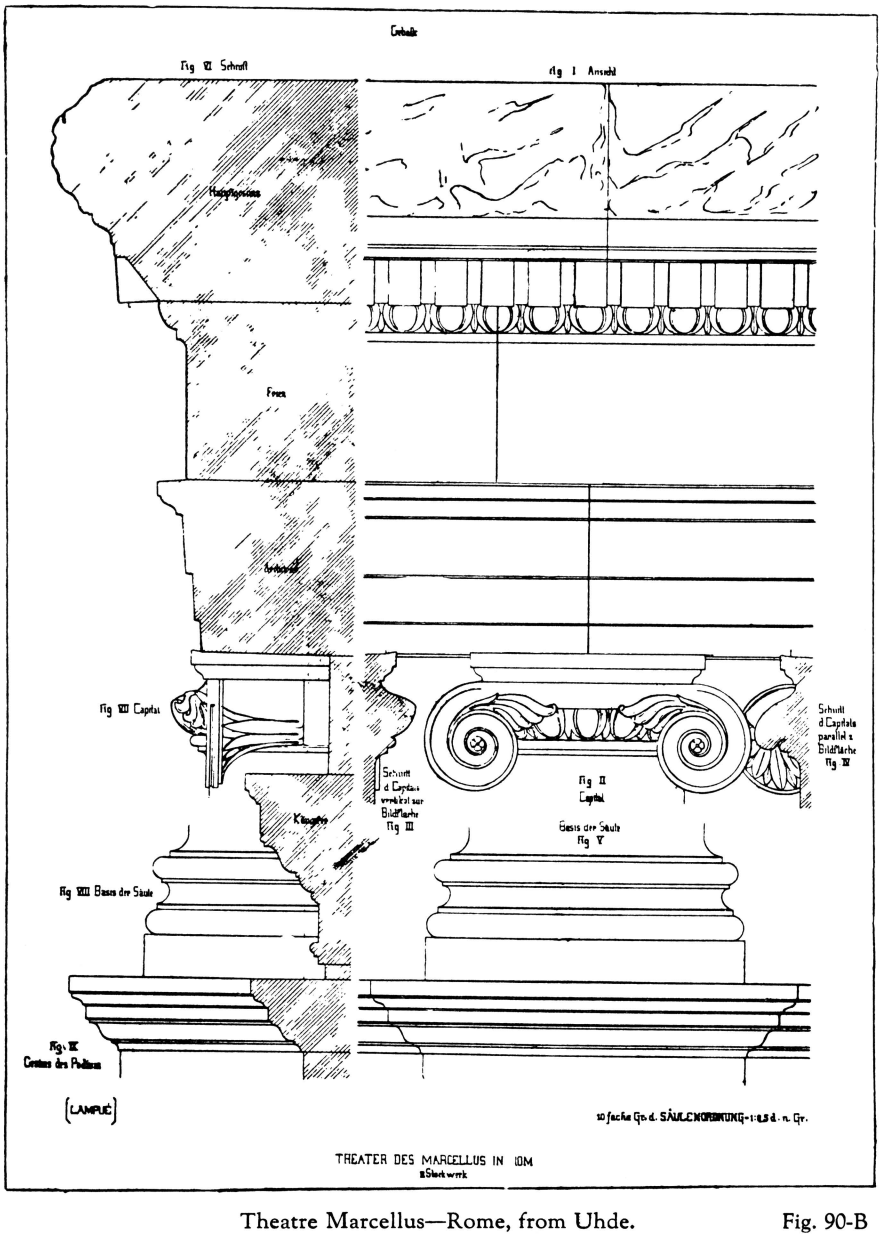
TEMPLE OF ISIS

EXAMPLES SHOWING MONOTONY OF EQUAL M'L'D'S

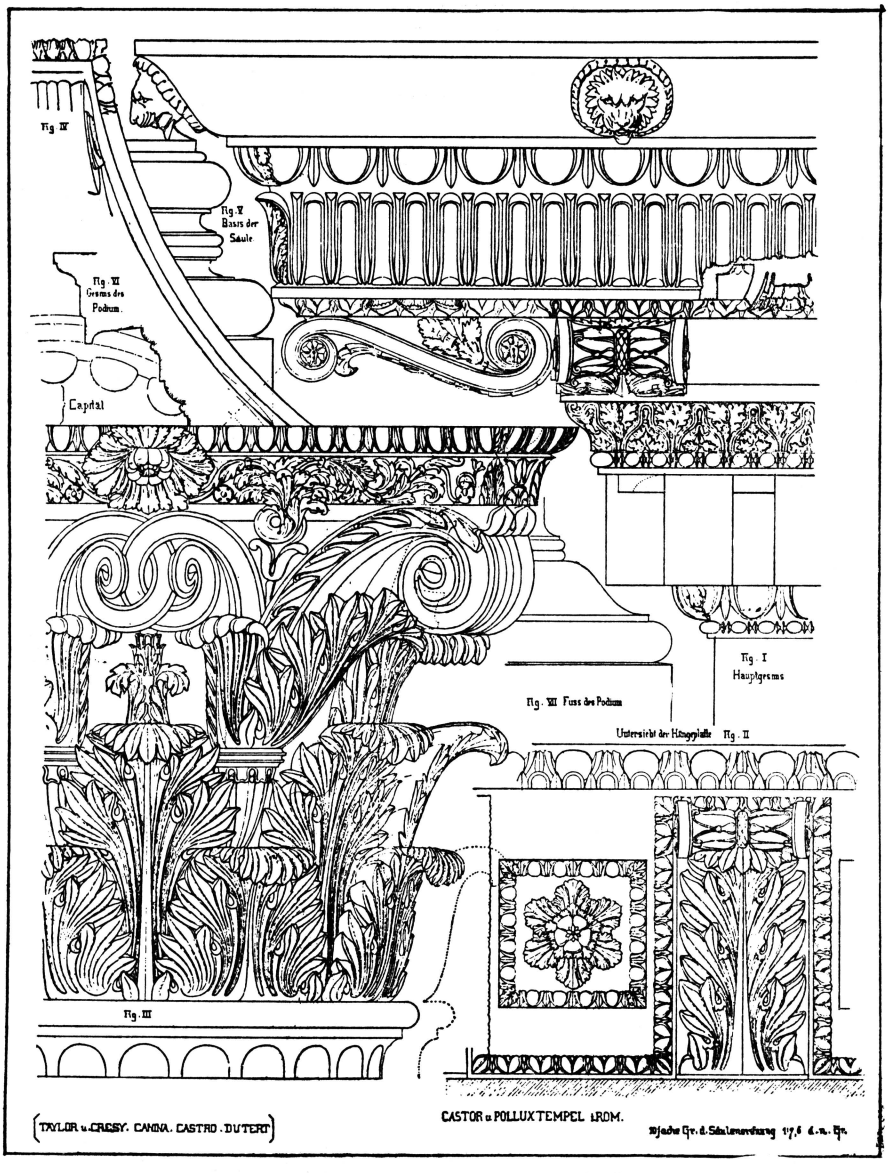
BASES



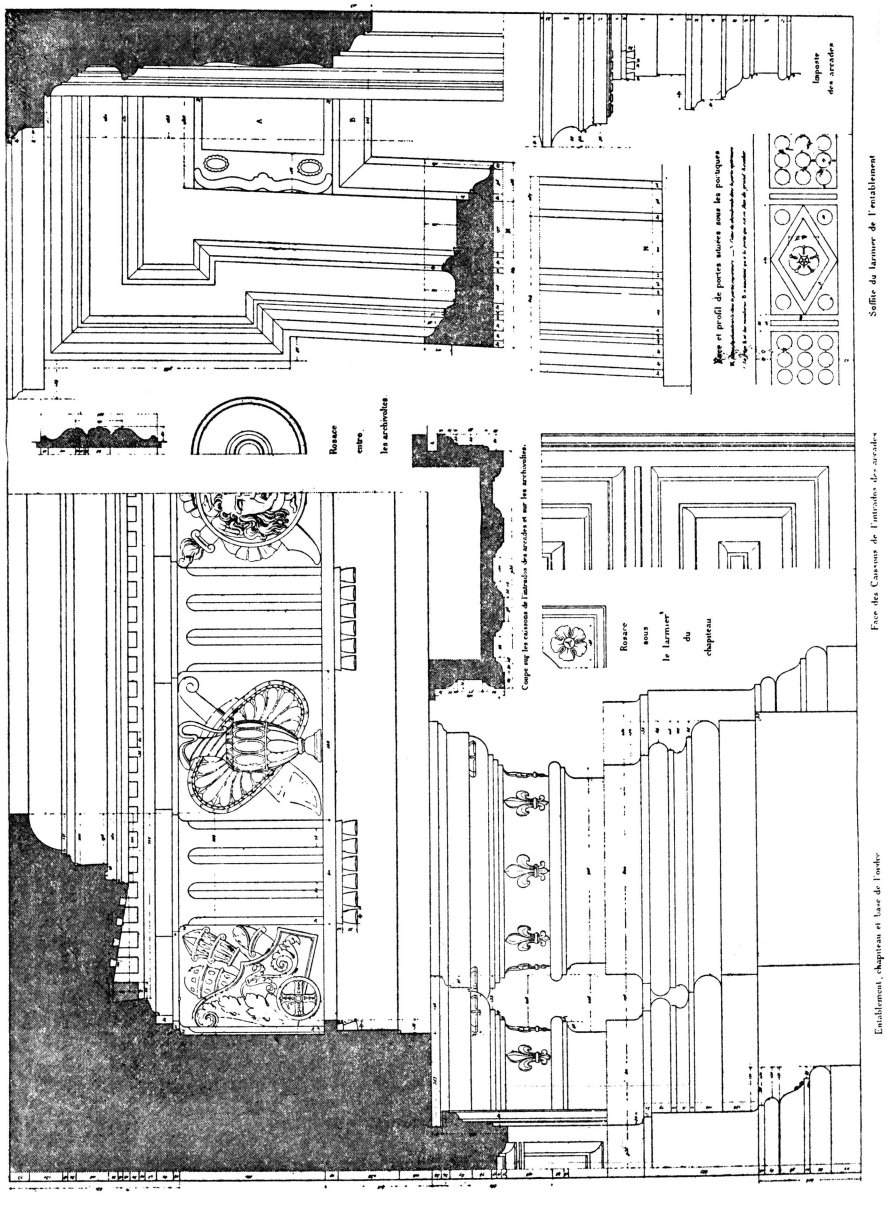
Theatre Marcellus—Rome, from Uhde. Fig. 90-A



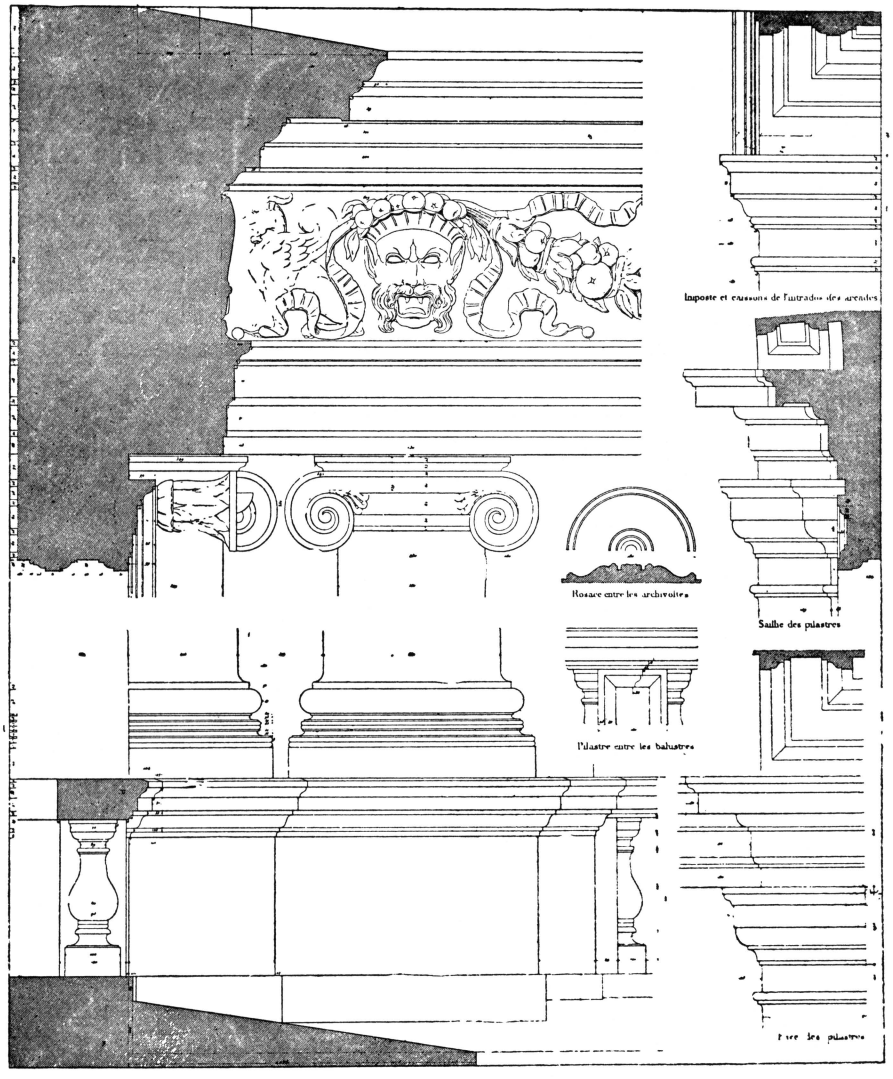
Theatre Marcellus—Rome, from Uhde. Fig. 90-B



Temple of Castor and Pollux, from Taylor and Cresy. Fig. 90-C


Rosace entre les archivoltes
Coupe sur les cauvets de l'intrados des arcades et sur les archivoltes.
Rosace sous le larmier du chapiteau
Face des Cauvets de l'intrados des arcades.
Entablement, chapiteau et base de l'ordre
Soffite du larmier de l'entablement
Imposte des arcades

Detail of Farnese Palace, from Letarouilly. Fig. 90-D



Detail of Farnese Palace, from Letarouilly. Fig. 90-E

The later Renaissance mouldings therefore are in many cases untrustworthy guides, and the true sources of classic work of which they were variants affords the best examples for study.

Spanish mouldings are redundant and have the emphatic dramatic quality of Spanish Art.

Mouldings naturally partake of the character of the architectural style which is prevalent at the time being, fantastic, aggressive and robust in the Italian Baroque and the period of Louis XIV. Delicate and fine in the time of Louis XV, and of the Empire.

All of these intimate variations and diversities, which are so infrequent in pure Classic work, tend at times to create charm, but are a subject for research, not for the generalization of these pages. They are the free spirit, the elfishness, the license of medievalism, tingling in the veins of the patrician classicism.

ORIENTAL MOULDINGS.

The peoples of the countries of the East, the lands of Asia and the realms of the followers of Mahomet pay comparatively little attention to mouldings with curved sections, excepting where the work shows Greek or Roman influence.

The architecture in most cases, though of stone, is obviously derived from wooden structure of the log cabin type, built up of squared timber and the buildings are replete with horizontal advancing and retreating planes, which are elaborately carved within the surface of the plane (Fig. 75).

In India there is comparatively little plain ashlar surface. Upper surfaces of the projecting planes take concave or convex shapes which have been suggested by roof forms. Capitals are bulbous, and the favorite curved mouldings when used at all are of S section. The succession of richly carved zones of narrow planes is most elaborate in its effect but is crude unless the surfaces are ornamented. The moulding system is undeveloped and practically ignored, the carving is often very beautiful.

A similar neglect of the development of mouldings is to be found in the work of the Mexicans, the Mayas, and the Incas in Peru, in fact mouldings seem to have been the especial study of the Classic and Gothic peoples, a study which has made it possible for work to have refinement and distinction without the employment of ornament.

CHAPTER XIII.

DESIGN OF MOULDINGS.

In designing the sections of mouldings there are certain considerations which appear to be fundamental.

First—*That the mouldings should be of a character appropriate to the material in which they are shaped.*

Second—*That the effect desired should be obtained without redundancy and should be dependent upon proportions rather than upon quantity.*

Third—*That the scale of mouldings should relate to the scale of the usual environment of man.*

Fourth—*That the scale should relate to the character of the objects upon which the mouldings are placed.*

Fifth—*That the effect desired should be obtained clearly and definitely.*

Sixth—*That some element of harmony should be adopted throughout the work.*

For mere purposes of examples the following suggestions are made, not as autocratic statements.

The character of the material especially influences the relative proportion of the projections of mouldings to their breadth, the two extremes of possibilities being in granulated stones and metals. The stone is easily broken and therefore thin edged projections are to be avoided, while metals are broken with difficulty and thin projections can be used.

As far as actual structural necessity is concerned, Classic mouldings, excepting the gutter moulding, are entirely superfluous, their purpose being to accent structure, thereby giving it greater clarity of expression and of scale, and distinction of detail.

It is obvious therefore that these mouldings can be and are often used in excess.

Gothic mouldings, developed from stone cutting, have certain definite structural derivations. They originate in lands in which there is much rain, and the cap stones of walls, i. e., the copings, and the upper part of buttress caps, and of projecting drip courses are bevelled to shed water, usually at angles in excess of 40 degrees.

As additional precaution against water running down the faces of wall surfaces the under side of projecting drip courses are hollowed, forming drip mouldings.

Another marked difference between Classic and Gothic mouldings is that seldom do Classic mouldings create a tone upon or in a plane to accentuate the plane, whereas Gothic mouldings constantly are grouped to announce planes by tones, and these groups are of varied character in order to create varied tones. As a result the variety of Gothic mouldings is much greater than that of Classic, they are less subject to tradition, and cover a larger proportion of surfaces than do Classic mouldings.

The scale of mouldings upon Architecture, should be subject within a somewhat limited gamut to the scale of a human being. The gamut is one that is occasioned merely by clarity of expression to ordinary eyesight, influenced by the distance of the point of observation from the object and by little else.

Interior details, unless the architectural cells are very large, require less magnitude in moulding sections than exterior. Brobdignagian mouldings, i. e., mouldings that are gigantic enlargements of normal mouldings, are confusing, and often monstrous, and usually crude in effect.

The effect of a building is considered both from afar and from near at hand. The natural result is to induce a study of its mouldings so that from both positions they may be satisfactory.

This occasions mass profiles and minor profiles within the masses, for instance the mass profiles for effect at a distance may be in a Classic cornice merely; simple bedmould, facia and cyma to a scale adequate for expression at a distance; but these factors may be and are further detailed for nearer observation.

The bedmould is elaborated by grouped mouldings, dentils and modillions; the cyma by accentuated spots such as the gutter spouts, by acroteria or by ornament, all of which are comparatively ineffective at a distance. The facia being a plane parallel to the ashlar requires little or no elaboration as it is a tone only.

The same is true of grouped Gothic mouldings, which at a distance give tone and shadow only, but near at hand require elaboration, or the effect is crude.

Size alone is but the beginning of the requisite study.

Upon portable objects mouldings should not be large, as large mouldings imply weight beyond the point of easy transportation. Much that seems crude would lose that quality if it were made in miniature, and occasionally work that seemed petty would gain by simple enlargement.

Clarity of expression and intention is better gained by few mouldings than by any. A marked example of this fact is to be found in the profiles of vase and bowl shapes, which can in themselves be considered as mouldings thoroughly expressing the purpose of the object and which are not improved by a multiplication of smaller accessory mouldings.

The elements of harmony in the uses of mouldings are the same as in other efforts of man.

Absolute similarity of factors produces a harmony which however is akin to monotony, and is therefore uninteresting, merely creating tones of surface.

Such are equal flutings, readings, etc.

Some element of contrast is essential to create interest. The simplest method is the introduction of opposing alternates, such as beads and hollows alternated. But as these would practically cancel each other if of equal size, one or the other must be dominant to fulfill intention. One of the best examples is the so-called Attic base. The continuous repetition of one type of section even if the size of the units is varied is but little removed from monotony, as many Francis I mouldings testify.

Alternation with an acknowledged dominant is therefore a very usual and successful method of obtaining harmony of interest through contrast, and further elaboration can be frequently clarified by the maintenance of this idea. Especially is this the case in all turnings, such as vase forms, balusters, etc. The curved sections demand separation by beads or fillets into their component factors if more than two curves (such as in a cyma) are used. The major factors of turned forms are usually cylindrical or elongated ovoids.

These fillets have been likened to conjunctions and prepositions in language. Grouped mouldings without them are like Browning's Caliban on Setebos.

The most effective method of harmonizing groups of mouldings is by keeping them within the same facial planes.

In Gothic work, this method resulted naturally because the stone work was blocked out in planes, inside of which the mouldings were cut, but in Classic work, the result must be obtained by autocratic action on the part of the designer.

THE ORNAMENTATION OF MOULDINGS.

As mouldings define by continuous lines of light and shade and shadow, it is obvious that the integrity of those lines should be maintained, and that all ornament upon them whether painted or carved or both, should be uniform repeats of identical units. Alternation of units does not, however, destroy the effect, and adds interest, but anything beyond this such as the use of ratios, weakens the effect of the mouldings.

Alternation has the virtue of enlarging the scale of the repeat without coarsening the detail.

Upon both carved and painted mouldings, any patterns are adaptable if the moulding section is not violated, though the patterns selected serve best when their axes are either vertical to or horizontal with the moulding.

In carved mouldings, however, it is best to allow the moulding profile to establish the unit of ornament, for instance if a cyma recta is carved upon a cyma reversa, the resultant effect is utter confusion of lines.

As ornamentation at once changes tone, it should be developed in all mouldings throughout the building or object ornamented, which were in harmonious tone before any ornamentation was begun. *There is no greater impression of lack of study or of incompleteness given to a design than that produced by ornamentation of isolated mouldings only.*

The introduction of units at a considerable distance apart upon mouldings, such as the ball flowers in Gothic hollows, and the crossed ribbons in Classic beads serves merely to accent and increase the scale of the design.

PANEL MOULDINGS.

Panelling originates in the structure of a wood screen or a wood wall covering.

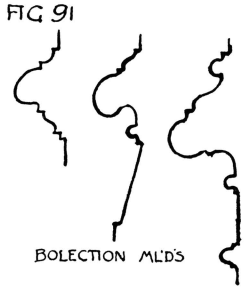
A separate development of wood mouldings appears in panelling. All panelling has a structural frame, the interstices of which are filled with a sheet or field called a panel.

The frame is necessary for adequate strength only, and the panels occupy, therefore, considerable more area than does the frame.

They can be and are when of wood thinner than the frame as they have no strain upon them; and, having considerable shrinkage, in thin panels they are confined loosely by the frame, either in a rebate or in a groove.

To hold these panels more firmly and closely and to cover the joint which might be exposed upon the edges of the panels, it has become the custom to carry a small moulding around the edge of the panel, fastened to the frame.

A quarter round and fillet, a cyma, or a bead sufficed, and was of the depth of the difference between the plane of the frame and that of the panel, and did not project in front of the face of the frame, but was flush with it, and was called a flush moulding. When these mouldings were elaborated later, those projecting in front of the face of the frame were known as bolection mouldings (Fig. 91).



Wooden panelling was imitated in stone, and frames or borders were carried around contained wall surfaces. The so-called linen panels or parchemins, are in reality a developed striated texture pattern of decoration.

MOULDINGS WITH GRADATIONS OF SECTIONS.

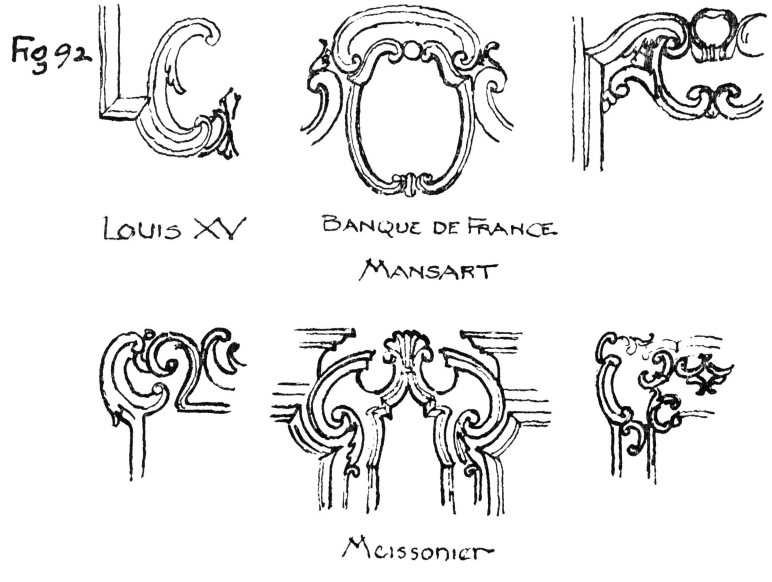
Much the largest number of these mouldings are to be found in furniture, although they exist in all architectural expression at times, especially during the periods of Baroque in Italy and Rocco in France.

The effect desired is one of stream lines converging or diverging, separating in the factors, and having radiation and rhythm. They are capable of very beautiful effects both to sight and touch as in the arms of Chippendale chairs, and are dependent entirely upon subtlety of carving. It is very difficult to represent these mouldings in drawing, as they require definition in all three dimensions, and can be studied adequately only in models.

Scrolls of all types are refined by being designed with these mouldings, and they occur early in the modillion scrolls of the Roman Corinthian order, and are constantly used in Renaissance consoles and capitals.

They are the intermediate link between the usual mouldings and carved ornament (Fig. 92).

C. HOWARD WALKER.



ARCHITECTURAL BOOKS

Van Pelt, Garrett—Old Architecture of Southern Mexico . $10.00

Walker, C. Howard—Theory of Mouldings . . . . . $ 3.50
Illustrated with several hundred profiles by the author.

Old English Cottages and Farm Houses, 2 volumes @ $10.00 $20.00
Shropshire—English half timber houses
Surrey— Brick and half timber

Curtis—Architectural Composition . . . . . $ 6.00
280 pages with 270 illustrations

Curtis—Elements of Graphics . . . . . $ 2.50
39 plates with text

Pugin—Specimens and Examples of English Gothic Architecture. A reprint in 2 portfolios of 337 plates . . $20.00

Esquie—Vignola, French edition translated by
Wm. Robert Powell . . . . . $ 6.00

Schmidt—Tyrolian Interiors. 60 plates from photographs.
Each plate embossed and mounted $16.50

Pugin—Ornamental Timber Gables of 16th Century in England and France . . . . . $ 5.00

Brown—Modern English Churches . . . . . $ 9.00
68 plates in portfolio

Brown—Modern English Country Houses . . . . $ 7.50
55 plates in portfolio

Di Nardo and Arnold—French Farm Houses, Small Chateaux and Country Churches $18.00
178 pages of illustrations with 11 pencil sketches

Vignal, Pierre—Water Colors of Venice, 15 plates in color . $ 5.00

Vignal, Pierre—Gardens of Rome, 15 plates in color . $ 5.00
Facsimile reproductions from Vignal's original Water Color Renderings

IN PREPARATION

Vignal, Pierre—Northern Italian Cities, 15 plates in color . $ 5.00

Vignal, Pierre—Naples . . . 15 plates in color . $ 5.00

Vignal, Pierre—Palestine . . . 15 plates in color . $ 5.00

Newcomb, Prof. Rexford—Mediterranean Domestic Architecture in the United States $15.00

McGrew—Italian Doorways $15.00
100 Doorways in photographs and measured drawings

Published by J. H. JANSEN, CAXTON BUILDING, *Cleveland, Ohio*